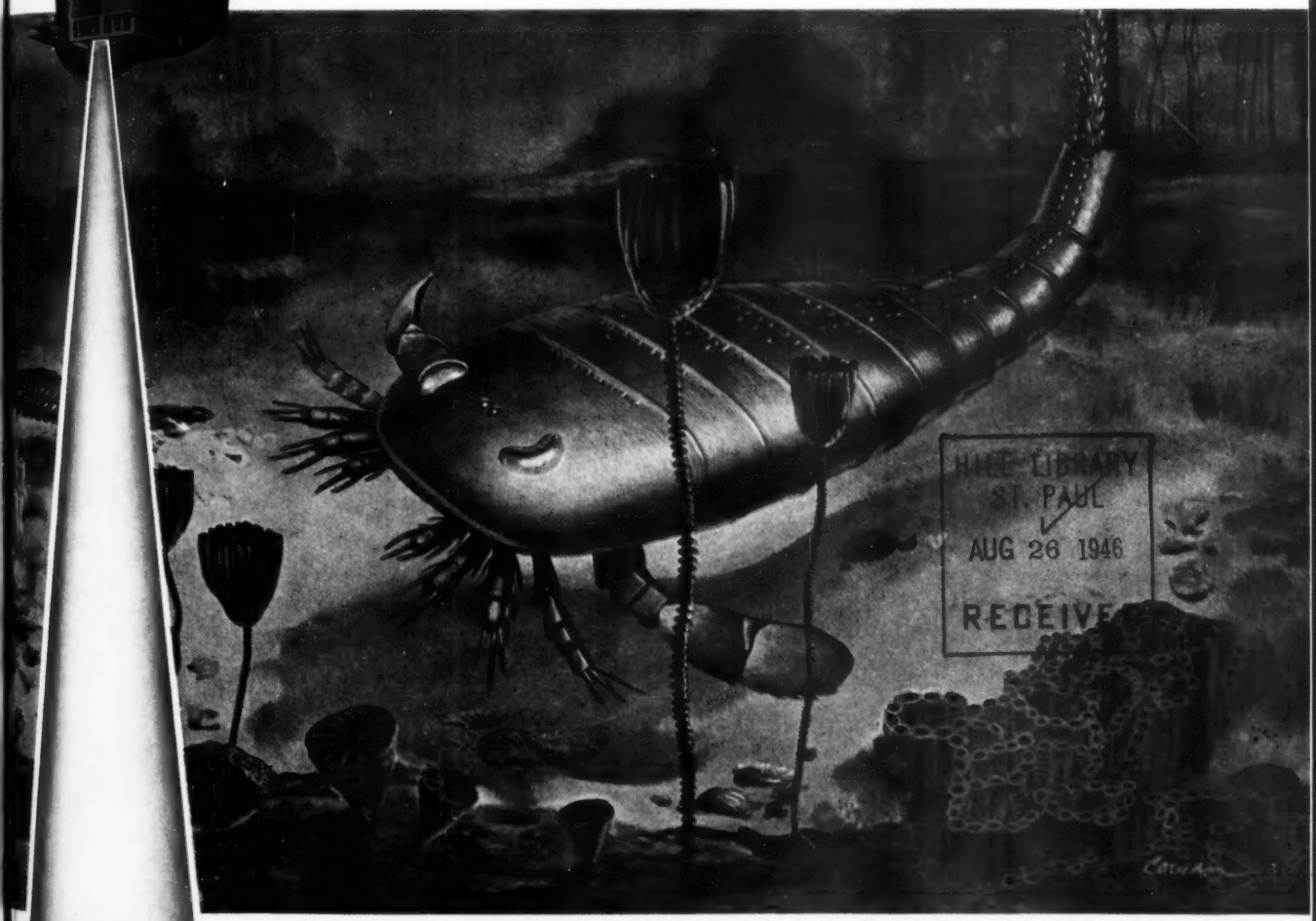
the OIL AND GAS JOURNAL

Thru the Ages with Hughes Rock Bits



Painted for the Hughes Tool Research Division Collection by John Pemberton Cowan

THE SILURIAN PERIOD *represents an advance in the evolution of life from the preceding (Ordovician) period. Reconstructed above* is an Eurypterid, a more complex Trilobite, living among Crinoids and Corals.*

*Full size color prints of this original painting will be sent upon request.

Beneath the impregnable barriers of hard lime rock, abrasive sandstone and dolomite of the Silurian formations, nature secreted vast oil deposits and challenged man to find them. The HUGHES ROCK BIT answered this challenge and became the means of funneling oil to the earth's surface through the deepest and hardest formations.

The SUPER RUGGED HUGHES W7R ROCK BIT is the preferred standard of the drilling industry in all of the hardest formations for straight hole, maximum speed and footage at minimum cost.

Hughes TOOL COMPANY HOUSTON, TEXAS

Standard of the Industry

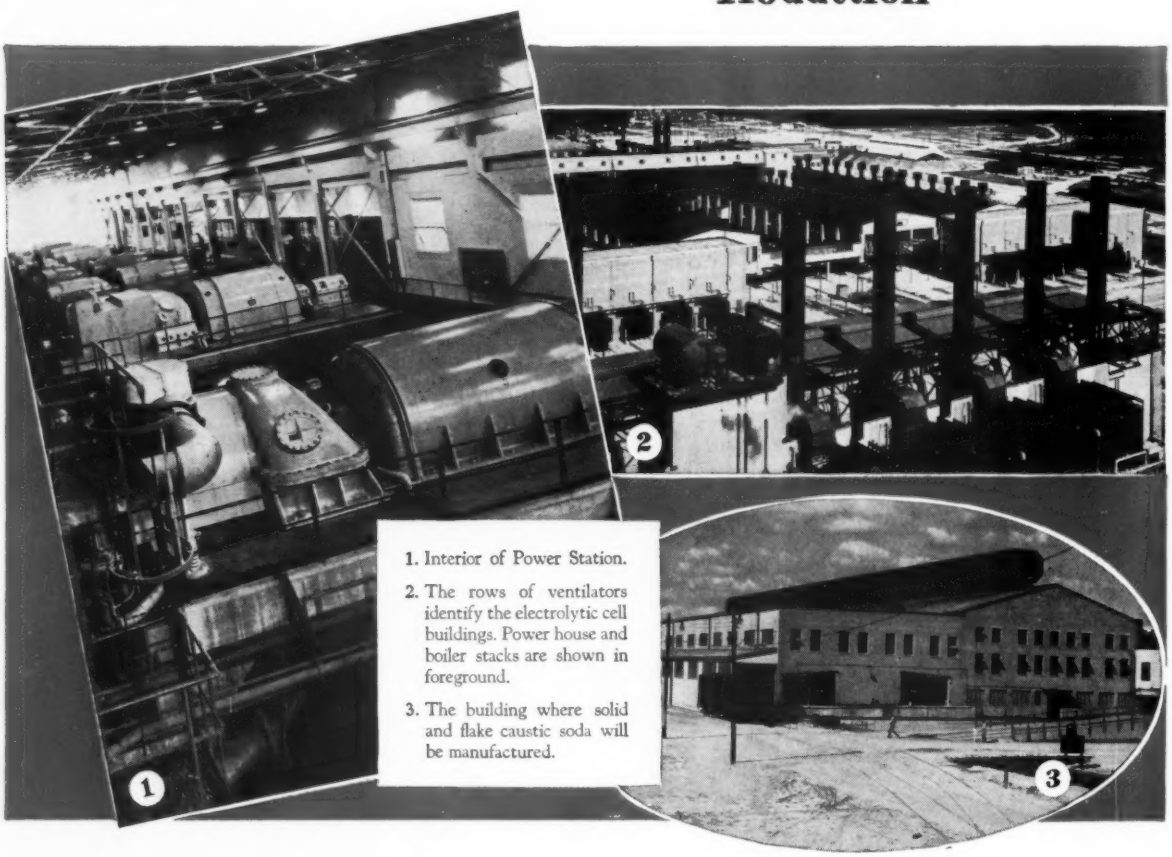
PRICE 20 CENTS

TABLE OF CONTENTS PAGE 55

AUGUST 24, 1946

Lake Charles Plant will increase

Caustic Soda—Chlorine Production



1. Interior of Power Station.
2. The rows of ventilators identify the electrolytic cell buildings. Power house and boiler stacks are shown in foreground.
3. The building where solid and flake caustic soda will be manufactured.

Built to make wartime magnesium, "Lake Charles" is being converted to the manufacture of chlorine and caustic soda. While actual production will not start until some time next year, the existence of certain vital facilities permits an earlier start than would be possible by constructing an entirely new plant. "Lake Charles" will be operated by The Southern Alkali Corporation—a Pittsburgh Plate Glass Company affiliate. Located in Louisiana, this plant adds an important link to a cross-the-country group of facilities, all strategically located to serve industry efficiently and economically. This group includes a Texas Plant at Corpus Christi—owned by The Southern Alkali Corporation—and Columbia plants at Barberton, Ohio, Natrium, W. Va., and Owens Lake, Calif.

COLUMBIA CHEMICALS

PITTSBURGH PLATE GLASS COMPANY

COLUMBIA CHEMICAL DIVISION

FIFTH AVENUE at BELLEFIELD, PITTSBURGH 13, PENNSYLVANIA · Chicago · Boston · St Louis Pittsburgh · New York · Cincinnati · Cleveland · Philadelphia · Minneapolis · Charlotte · San Francisco

COLUMBIA ESSENTIAL INDUSTRIAL CHEMICALS

Soda Ash • Caustic Soda • Liquid Chlorine • Sodium Bicarbonate • Pittchlor *(Calcium Hypochlorite)* • Silene EF *(Hydrated Calcium Silicate)* • Calcium Chloride • Soda Briquettes *(Iron Desulphurizer)* • Modified Sodas • Caustic Ash • Phosflake *(Bottle Washer)* • CalceneT *(Precipitated Calcium Carbonate)*

the OIL AND GAS JOURNAL

published weekly by the

PETROLEUM PUBLISHING COMPANY

211 S. CHEYENNE AVE., TULSA 1, OKLAHOMA

FOUNDED IN 1910 BY PATRICK C. BOYLE

Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Note: Payments from outside the U. S. A. may be in the form of an international money order or check on a U. S. A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879.

Copyright 1946 by The Petroleum Publishing Co

Vol. 45, No. 16 August 24, 1946

P. C. LAUINGER, *President* — C. O. WILLSON, *Editor*

S. H. ROURKE, *Business Manager* — KENNETH B. BARNES, *Engineering Editor*

R. C. MAC DOUGALL, *Circulation Manager* — ARCH L. FOSTER, *Refining Editor*

W. L. NELSON, *Technical Editor* — PAUL REED, *Pipe-Line Editor*

Associate Editors

LYNN M. NICHOLS — NEIL WILLIAMS

CHARLES J. DEEGAN — R. B. TUTTLE

D. H. STORMONT

District Editors

HERNDON DAVID, Tulsa 1, *211 S. Cheyenne Ave.* — DAHL M. DUFF, Tulsa 1, *211 S. Cheyenne Ave.*

TOLBERT R. INGRAM, Denver 11, *4556 Alcott St.* — E. H. SHORT, JR., Houston 2, *Sterling Bldg.*

H STANLEY NORMAN, Los Angeles 14, *328 A, 810 S. Broadway* — HENRY D. RALPH, Washington 4, *Natl. Press Bldg.*

GEORGE H. WEBER, Dallas 1, *Mercantile Bank Bldg.* — WARREN W. BURNS, New York 17, *415 Lexington*

VICTOR LAURISTON, Chatham, Ont., *35 Stanley Ave.* — O. C. PRESSPRICH, Saginaw, *News Bldg.*

C. DUDLEY JOHNSTON, *Staff Artist* — L. L. JONES, Jr., *New Equipment*

Advertising

WAYNE RIVES, *Manager*

KENNETH J. LANGLEY, *Eastern Manager*, New York 17, *415 Lexington Ave.* — CHARLES A. WARDLEY, *Pittsburgh Manager*, Pittsburgh, *435 Fourth Ave.*

C. R. FARMER, *Chicago Manager*, Chicago 2, *105 W. Madison* — J. HOWARD TINKHAM, *California Manager*, Los Angeles 15, *1408 S. Grand Ave.*

J. V. PENNINGTON, *Gulf Coast Manager*, Houston 2, *Sterling Bldg.* — A. J. CHAMBERS, Beckenham, Kent, England, *33, The Avenue*

MITCHELL TUCKER, *Manager, Research Dept.*, Tulsa 1, *211 S. Cheyenne Ave.* — JOHN D. REILLY, *Production Manager*, Tulsa 1, *211 S. Cheyenne Ave.*

Member

Audit Bureau of Circulations

Associated Business Papers

Table of Contents

NEWS DEVELOPMENTS

State Department Promotes International Control Body 58
Jersey Standard Expands Executive Training Plan 58
Texas September Allowable to Yield 2,102,476 Bbl. Daily 59
Oil Workers Plan 36-Hour Week; Great Lakes Tankers Struck 59
Carter to Build New Billings Refinery 60
Texas Producers Group Declares Against Stripper Payments 60
What Others Says 62
Shell Oil's New Crude Postings Detailed 63
Phillips Plans Gulf Coast Distillate Plant 63
Sands, Variety of Crudes Complicate West Guara Exploitation 66
Pacific Coast Residual Prices Up; New York Reports Shortage 74
Deaths in the Industry 74

Editorial 57
This Week 61
International News 64
Watching Washington 73
Refining News 132
Pipe-Line News 134
Natural-Gas News 137
Natural-Gasoline News 137

ENGINEERING AND OPERATING

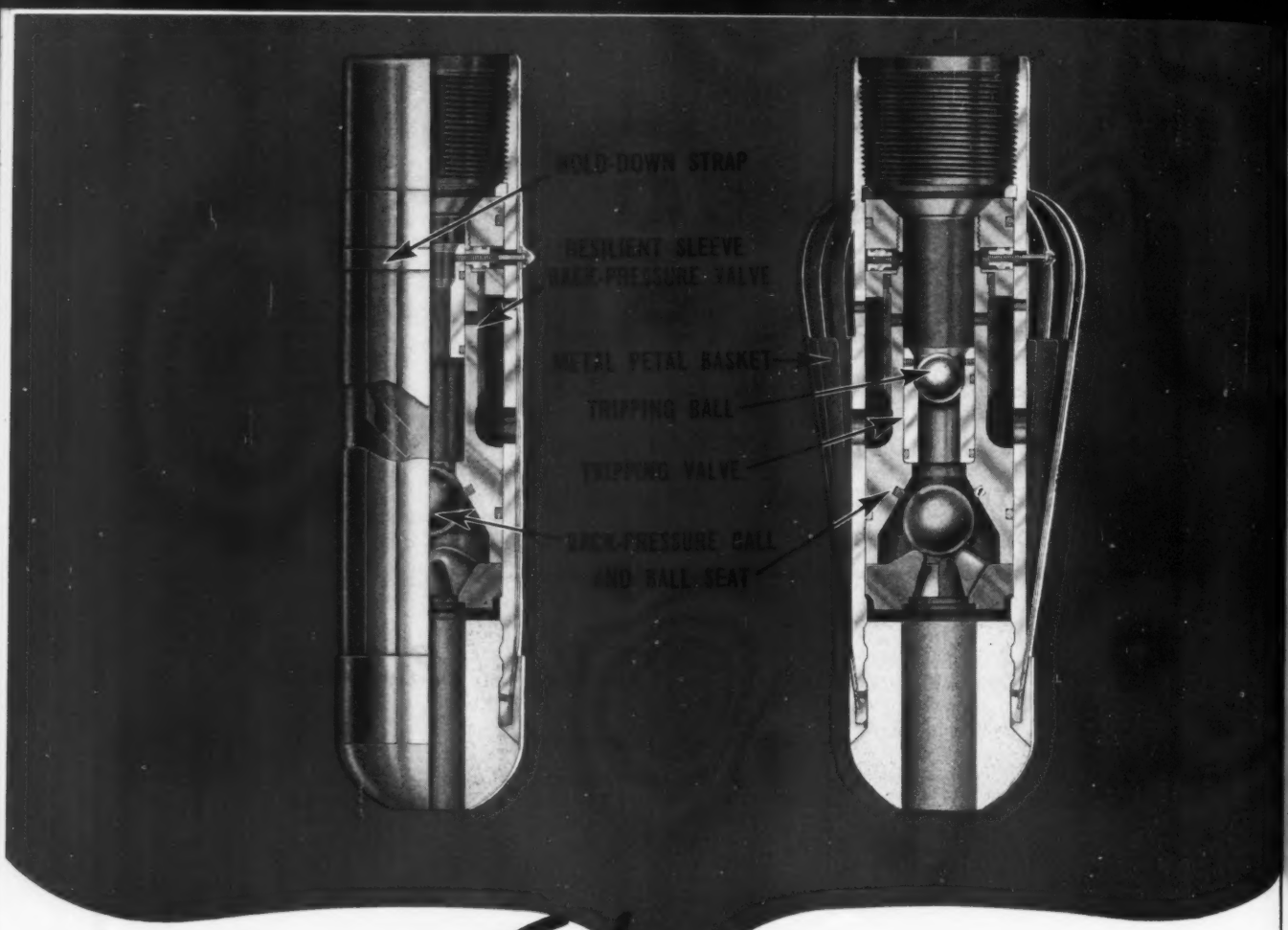
Production Trend in Lone Star's Grapeland Recycling Plant .. 76
TXL Is Representative of New Pre-Permian Fields 81
East Texas Salt-Water Disposal 86
Questions on Technology 92
Effect of Well Spacing on Oil Recovery 97
Book Reviews 116
Safe Field Practices: Adjustable Safety-Belt Tail Line 121
The Refiner's Notebook 127
Engineering Fundamentals 131

EXPLORATION AND DRILLING

Daily Well-Completion Record 138
Daily Average Production for Week 139
Devonian Production at Mattoon 141
Reports by Areas Start on Page 141
Summary of July Completions 156

ADDITIONAL FEATURES

Market Summary 138
Crude-Oil Prices 138
Drilling Contractors 158
Calendar of Events 159
Personals 160
Men in Equipment News 163
Classified Advertising 165
Advertisers' Index 168



THE BAKER *Triplex* CEMENTING SHOE does an important job...and does it well!

The "Triple" purpose of the Baker TRIPLEX Cementing Shoe is to pack-off in large-diameter, or irregularly-shaped holes, retain all cement slurry above the shoe, and protect permeable, low-pressure formations below from cement contamination.

All cement slurry is directed upward through side whirler ports. A sleeve-type, resilient rubber back-pressure valve opens readily to permit passage of the slurry into the annulus around the shoe, but closes instantly to prevent any return flow of slurry. The Baker Metal Petal Basket is intended to form a bridge, thus preventing cement slurry from settling into permeable, low-pressure zones below. The Basket is indispensable in large-diameter, or irregular-shaped holes.

The Baker TRIPLEX Cementing Shoe (Product No. 136) operates as a conventional float shoe while running-in the casing. Then, after reaching the desired point in the hole, circulation is established through the ample interior passageway of the shoe, and the hole is conditioned preparatory to cementing. The Tripping Ball now is pumped (or allowed to gravitate) down the hole to seat upon the Tripping Valve. A pressure of 400 to 500 psi is applied to the casing which shears the screws in the Tripping Valve, permitting it to move downward and expose the cementing ports. Shearing these screws also releases the hold-down strap around the basket, allowing the basket to expand outwardly against the wall of the hole. The cementing operation is then carried out in the conventional manner with all cement slurry directed upward and held above the shoe by the expanded Baker Metal Petal Basket.

The Baker TRIPLEX Cementing Shoe consists of a whirler float shoe with a Baker Metal Petal Basket fastened on the shoe below the cementing ports. All internal parts are made of readily drillable materials. Two one-half inch set screws hold the inner assembly stationary to facilitate drilling out the shoe.

Contact your nearest Baker office or representative for details and recommendations.

BAKER
OIL TOOLS

BAKER OIL TOOLS, INC., LOS ANGELES • HOUSTON • NEW YORK

THE OIL AND GAS JOURNAL

Clarification of Issues

THE entire petroleum industry has an interest in the decision of 21 major oil companies and the American Petroleum Institute to insist upon clarification of charges in the Government's antitrust suit pending in the U. S. District Court in Washington. The suit has been aptly designated the "Mother Hubbard" case, presumably because it covers everything and touches nothing. In addition to the motions one defendant company has filed answers denying the allegations where there was sufficient lucidity to know what was being charged.

The Government's position in this case is not only untenable but approaches the ridiculous. The suit was filed 6 years ago. Then came the war, and the Department of Justice at the request of President Roosevelt announced that the case would not be pressed during the emergency. Thus the defendants were not only permitted but were encouraged to do everything of which the prosecutors complained in order to help win the war. If a genuine public interest was involved in this case, obviously the administration would have felt obligated to bring the case quickly to trial in order to end any unwanted practices as the nation prepared for war.

Now the war is over, the companies concerned have been officially commended for their major contributions in a national emergency, and their reward is to be revival of accusations the scope and intent of which have never been made clear.

It is apparent that all the operating practices of this industry are involved. Including the subsidiary units more than 200 companies are named in the suit and their activities run the gamut of petroleum operations. If what they do is wrong then the entire industry is wrong and any changes brought about by the Government's action will be reflected generally.

Because of its previous procedure with other industries there is the suspicion that the Government has a consent decree as its objective in this case. This judicial device has many ramifications but all add up to the Department of Justice being given the legal right to control certain operations of those who consent to the action. In this instance, as in several others, the defendants constitute such a large part of the total operations, with all activities interrelated, that a consent decree, in effect, would give the Justice Department regulatory powers which would be industry-wide in their application. Operators, large and small, want no part of this initial wedge looking to complete control of the oil business by the Government.

The real issues, if any, involved in this suit include price, wages and working conditions, profits, and adequate current and future supplies. With the industry's background of public service, let the Government explain its charges against each defendant and then try the case on its merits.

State Department Officials Promote International Oil-Control Body

WASHINGTON. — An international oil-control body functioning under the United Nations may be necessary to promote orderly development of the world's petroleum resources and prevent international friction over oil matters, is the view of leading State Department officials.

This view was brought out in an NBC broadcast Sunday night by John A. Loftus, chief of the petroleum division; Charles B. Rayner, adviser on petroleum policy; and Col. G. H. Vogel, executive officer of the Army-Navy Petroleum Board.

Both Vogel and the state officials agreed that within 20 years the United States will have to import half its oil, and Vogel said the Army and Navy are considering setting aside further oil reserves in this country for military use as well as maintaining access to foreign oil.

"Oil is a major irritant in international affairs and it will continue to be a point of friction and conflict until the nations get together and work out some fair way of keeping disputes to a minimum and some orderly way of developing the world's oil resources," Loftus said. Agreeing that it is a matter of our national interest to promote oil production in many parts of the world, Rayner said: "We believe that in the near future a general international policy should be developed for the oil industry. Monopolies should be discouraged, and the way should be opened for small oil companies as well as large ones to enter the foreign field. The world's oil should be made available to all nations on equal terms. Some sort of world-wide oil committee or authority under the United Nations might be the answer. It should represent the consuming nations as well as the producing nations. Its first duty would be to study the international oil trade, and to be prepared to advise what is most beneficial to all parties."

May Need More Power

Loftus added that such a world oil organization might need more power than the purely advisory functions of the commission contemplated by the Anglo-American petroleum agreement. "For instance," he said, "it might review the terms of oil concessions and contracts, and suggest revisions. It might serve as a sort of appeals board or arbitral tribunal, where nations—and oil companies, too—that feel they have been subjected to discrimination could come to seek a hearing and perhaps an adjustment. It begins to look as if the foreign activities of American oil companies are a matter of real public concern, that they are vested with the public interest, something like public utilities."

This tribunal might adjudicate disputes over compliance with the terms of contracts and concessions and should have the authority of the United Nations behind it, Loftus said, suggesting that the oil organization come directly under the United Nations Economic and Social Council when that is formed.

Meanwhile, in New York, sharp criticisms of projected international oil plans of the State Department came from several high-ranking petroleum officials following the address by Loftus at University of Pittsburgh, July 30, on "Oil in the United States Foreign Policy." Objections, moreover, have been made direct with interested British Government officials, as well as with the U. S. State Department.

Nature of Objections

Specifically, the objections center around that part of Loftus' address where he discussed "the pattern of international consultation on oil." As it is generally known that such addresses are not released before the text has been "screened" by top officials in the State Department, oil men point out that this is particularly significant as it indicates the trend of thought in higher political echelons.

The Loftus address indicated the State Department intends to foster an organization, possibly a division of the United Nations, whereby foreign countries will be asked to abrogate legally-drawn-up contracts in order to obtain either more royalties or because some outside political force is urging that the matter be brought up for purely "mischievous reasons."

One source points out that this is "a direct about-face" in the State Department's approach to international oil problems, for the State Department has already given its approval to the projected Anglo-American Petroleum Agreement. The basis of the treaty is that contracts legally entered into should be respected.

Oil men in New York pointed out that Loftus in his address said:

"Such a body (meaning an instrumentality of the United Nations) might additionally have authority to review the terms of concession contracts and to recommend revisions thereto," Loftus says, adding: "Nations which had already concessioned out part or all of their petroleum resources to private foreign companies might be free to appeal to such international body for a review of either the terms of the concession arrangements or the concessionaire's compliance.

"Nations believing themselves to have inadequate access or at unreasonable prices to the oil supplies of the world would be free to appeal to the international body for a review of the circumstances of the case; and the international body might be authorized to recommend to governments and companies corrective measures if such were needed. Through fact-gathering facilities of the international body such basic facts of the international oil trade as costs, prices, royalties, inter-company contracts, and similar data would be of public record available internationally."

Jersey Standard Expands Executive Training Plan

NEW YORK.—Expansion of the executive development program of Standard Oil Co. (N. J.) following appointment of George B. Corless, formerly with Humble Oil & Refining Co., as adviser to coordinate the work of training future leaders for the business, was announced last week by Eugene Holman, president.

Holman said the program is intended to develop a reserve of executives of broad training and experience for Jersey Standard and affiliated companies. "The mass production and distribution methods necessary to satisfy the needs of people everywhere result in organizations which in our opinion can best be administered by a decentralized form of management," he said. "This type of administration increases the demand and opportunity for larger numbers of skilled executives than ever before."

Managements are encouraged to appoint more than one assistant to department heads as a means of providing an insight into the operation of different branches of the business. Although recognizing that this practice sometimes results in overstaffing the departments from the strict point of view of the efficiency expert, the cost is considered justified when viewed in terms of the long-run benefit.

Corless, who will activate the program, is a veteran oil man, geologist, and mining engineer. He resigned from Humble, a Jersey affiliate. He will maintain liaison with affiliated companies in exchanging techniques in carrying on the executive training program.

Texas' Allowable in September To Yield 2,102,476 Bbl. Daily

AUSTIN.—The Texas Railroad Commission at its monthly proration hearing last week again reduced the state's production by setting a September allowable of 2,242,641 bbl. daily—41,946 bbl. under the currently authorized production.

Divergent recommendations on allowables in various sections of the state were pressed at the state-wide hearing. Some operators sought correction of alleged inequities in West Texas allowables; others asked that any changes be preceded by special hearings. Gulf Coast independent refiners appealed for more crude, and a 60 or 90-day order was advocated by one operator.

Basis for the commission's September order was cited by E. O. Thompson, commission member, who said that in a year, crude in storage had increased 9,000,000 bbl. and gasoline in storage 1,838,000 bbl.

With an estimated underproduction of 6.25 per cent, total Texas production is expected to be 2,102,476 bbl. daily in September, or 17,524 bbl. under the Bureau of Mines' September forecast of 2,120,000 bbl. daily, which was unchanged from August. An estimated production of 175,073 bbl. daily of natural gasoline and distillate will bring the total daily output to 2,277,549 bbl.

Producing Days Reduced

Reduction of the new allowable was brought about through lowering producing days generally over the state to 24 in September, compared with 26 in August. West Texas was cut 1 day to a total of 21; East Texas was left at 21; and the Texas Panhandle continues exempt. Wasson pool of West Texas was exempt from shutdown days after having two in August but the commission lowered the allowable to the current production rate.

Claims of inequities in West Texas pools were made by Elmer Patman, Houston, representing Superior Oil Co., who told the commission that it should take a "very deliberate look at West Texas as between allowables and as between fields."

H. P. Nichols, Tyler, speaking for C. V. Lyman, Midland operator, backed Patman's statement and said that if the commission used a yardstick on one field, the same should be used on all fields. However, Ira Butler, Fort Worth, representing Amon Carter and others, told the commission he knew of no unusual discrepancy in West Texas and asked that no drastic changes be made without special hearings.

Nelson Jones, of Humble Oil & Refining Co., said the present West Texas allowable is 6,000 bbl. above pipe-line capacity and requested a reduction of that amount. On the other hand, Raymond Myers, of Magnolia Petroleum Co., sought a boost of four producing days at Fullerton pool to lift its allowable from 27,000 bbl. to 32,000 bbl. a day.

Independent refineries on the Gulf Coast, including Danaho Refining Co., Crown Central Petroleum Corp., Republic Oil & Refining Co., Eastern States Petroleum Co., and American Liberty Oil Co., requested additional crude. Joe Hill, American Liberty vice president, asked for the 60 to 90-day allowable in order to make longer-term contracts possible. Hill discounted Thompson's increased storage figures and took a swing at federal government agencies in general as he argued against reduction of Texas oil allowables for September.

An order increasing salt-water injections in East Texas was issued by the commission, effective September 1, as the request of Joe Zeppa, Tyler. Zeppa said that due to the price raise it was possible to increase water injection from 50 to 60 bbl. per 1 bbl. of bonus oil. Paul McDermott, Fort Worth, attorney for Sinclair Prairie Oil Co., produced evidence showing the East Texas field has regained the 10-lb. pressure drop which occurred during the 24 producing days in April. He asked raises wherever possible, with East Texas specifically mentioned. McMurray Refining Co., Tyler, also sought an additional 2,000 bbl. daily in East Texas. Bottom-hole pressure in East Texas was reported to have increased 8.40 lb. during July, to 1,013.86 lb. on August 1.

Date for the next state-wide proration hearing was set for Friday, September 13. Early scheduling will permit whatever changes will be necessary in the basic allowables as a result of the hearings now being held on maximum efficiency rates, it was said.

Oil Workers Plan 36-Hour Work Week; Great Lakes Tankers Struck

LABOR developments affecting oil-industry operation returned to the headlines during the past week as a result of two widely separated strikes and the Oil Workers Union convention in Fort Worth.

The C.I.O. oil workers brought their Fort Worth convention to a close after adopting a resolution authorizing a campaign for a return to the 36-hour week without loss in take-home pay.

The delegates also voted a resolution asking Congress to lower the social-security retirement age from 65 to 55 and to double retirement benefits. Also approved was a slate of nominees for international officers, including all incumbents, who will be voted on in a mail ballot within 60 days. The 1947 convention was set for Kansas City. Rejected was a proposal to increase members' dues from $2 to $3 a month.

The Great Lakes shipping strike by the C.I.O. National Maritime Union tied up an undetermined number of vessels, including tankers. Some crude was reported backing up in the United States. Also involved were refined products shipped through the lakes as far north as Duluth. A total of about 74 tankers and oil barges normally operate on the lakes. One of the two companies reported negotiating for possible pattern settlements was Standard Oil Co. (Ind.) which operates a tanker fleet.

The second walkout was that of C.I.O. union rig builders in East Texas, North Louisiana, Arkansas, Mississippi, Alabama, and Florida. A. R. Kinstley, vice president of the O. W. I. U., said he would ask for a meeting within 30 days with rig building contractors in 27 Mid-Continent states to discuss wages.

The rig builders were reported demanding a 20 per cent pay raise from $20 to $24 for an 8-hour day. Some 20 contractors were reported to have proposed settlement on the basis of a $2 per day wage increase with a car-hire increase of $3 per day. Two crews in the Tyler, Tex., area were understood to have returned to work after contractors agreed to meet the 20 per cent wage demand.

In the West Edmond field of Oklahoma County, Oklahoma, operations of Denver Producing & Refining Co. were halted when members of the O.W.I.U. walked out. R. G. Rapp, company president, said the strike was called because two union members were laid off in a general reduction of employes.

Texas Producers Group Declares Against Stripper Payment

DALLAS.—The Texas Independent Producers and Royalty Owners Association last week became the first oil-industry organization to come out openly against the federal stripper-well subsidy.

At a meeting here, a majority of the executive committee of the association voted unanimously to place the organization in opposition to "any and all subsidies." A statement by H. J. Porter, president of the association, said such a payment "would shortly lead to complete federal regulation of the entire oil and gas-producing industry. . . ."

The association was organized at a meeting in Austin last March 15. At the time, one of its primary aims was removal of the oil industry from control by the Office of Price Administration.

The question of continued federal payments to promote stripper production has become highly controversial even within the oil industry. A considerable segment of the industry is known to be opposed to such payments, though the Texas group is the first known to declare itself publicly in opposition. Under the new OPA law, the payments will continue only until April 1, and some stripper operators are actively campaigning for a permanent payment. They say the payment is an oil-conservation bonus and that the word "subsidy" is a misnomer.

The text of Porter's statement issued following the action of the Texas Independent Producers and Royalty Owners Association follows:

"A certain element among the stripper-well oil producers is endeavoring to obtain federal conservation legislation which would make their subsidies on oil permanent. The present price of crude oil in most of the stripper well fields without the subsidy is higher than it was on March 1, 1946, at the old OPA price plus the subsidy.

"If there was any organized effort on the part of stripper well producers as such to obtain release of the oil industry from OPA controls, I have not been able to find anyone that knows anything about such activity, so apparently they were satisfied with the price they were getting for their oil under the OPA. If the old OPA price plus the subsidy would conserve these stripper wells as they claim, then the present price of crude oil without the subsidy should conserve them.

"In my opinion, a subsidy on crude oil will only increase the earnings of stripper wells at the expense of the public. A fair price for crude oil will not only keep the stripper wells in production but will cause increased exploratory drilling which will build up the nation's reserves of oil. A federal conservation law as to stripper wells would shortly lead to complete federal regulation of the entire oil and gas producing industry which we are opposed to for the oil industry or any other industry.

"Over 40 per cent of the nation's oil reserves are in the state of Texas and the Railroad Commission of Texas has pioneered conservation of oil and gas and knows more about conservation of oil and gas than any bureau that might be set up in Washington to do the job. The people of Texas certainly do not want one of their largest basic industries regulated from Washington. Federal regulation would not be as efficient as state conservation regulation and populous states like Pennsylvania with their stripper wells would have more voice under federal regulation than a state like Texas with 40 per cent of national reserves.

"If we are to continue to find adequate domestic reserves, the oil and gas-producing industry must be left free of bureaucratic federal control. A permanent federal conservation law giving the stripper oil wells a subsidy means complete federal control of the oil and gas-producing industry."

Besides Porter, officers of the association are E. I. Thompson, Houston, executive vice president; E. H. Griswold, Midland, secretary; and John W. Naylor, Fort Worth, treasurer. Vice presidents and members of the executive committee are Walter Henshaw, San Antonio; C. K. McCan, Victoria; Glenn H. McCarthy, Houston; Guy Warren, Corpus Christi; Walter W. Lechner, Dallas; Arch Rowan, Fort Worth; W. F. Nenney, Tyler; Bryan Payne, Tyler; J. D. Sandefer, Jr., Breckenridge; M. D. Bryant, San Angelo; C. V. Lyman, Midland; E. G. Kadane, Wichita Falls; and A. E. Herrmann, Amarillo.

Carter to Build New Billings Refinery

PLANS for the construction of a new refinery at Billings, Mont., by Carter Oil Co. were announced last week by O. C. Schorp, president of the company.

The new plant will have a capacity of 18,000 bbl. per day of crude throughput and will include a catalytic cracking unit. The plant throughout will be of the most modern design, embodying all the latest improvements, Schorp said.

Schorp said engineers are now working on the design and work will begin as soon as this is completed. However, some delay in the delivery of equipment may be anticipated, and it was estimated the plant probably would not be ready for operation before 1948. In so far as possible employes of the new refinery will be recruited from the present Carter manufacturing organization.

"The new plant, which will cost about $8,000,000, will be the largest of its type in the state of Montana as well as the largest in the entire Rocky Mountain territory, as far as we know now," Schorp said.

Carter now operates two refineries in Wyoming and two in Montana. These plants, with daily crude capacity, are: Billings, Mont., 10,000 bbl.; Cut Bank, Mont, 4,000 bbl.; Lovell, Wyo., 3,000 bbl.; and Newcastle, Wyo., 1,600 bbl.

This is a 10-by-13-ft. scale model of the new $8,000,000 refinery to be built at Billings, Mont., by Carter Oil Co.

THIS 1946 SMTWTFS WEEK

PRODUCTION— Texas Railroad Commission cuts September allowable 41,946 bbl. daily. . . . Expected September yield in nation's largest producing state figured at 2,102,476 bbl. daily. . . . Crude and gasoline storage increase cited as basis for reduction. . . . ¶Geological Survey reports production on U. S. lands totaled 59,567,525 bbl. crude in fiscal year ended June 30 against 55,907,088 in previous fiscal period. . . . ¶U. S. output in August 17 week gains 36,398 bbl. to total of 4,860,118 bbl. daily. . . . Kansas shows 16,500-bbl. daily increase. . . . ¶Well completions down to 511 total in same week against 547 in previous week. . . .

INTERNATIONAL— Russian action in withholding Zisterdorf oil from Allied occupation zones in Austria causes critical motor fuel shortage. . . . General Clark accuses Russians of hamstringing Austria's economic recovery. . . . ¶First tanker arriving in United States with Middle East crude docks in Philadelphia. . . . Gulf to use 115,000-bbl. shipload from Kuwait concession in test refinery run. . . . ¶Iranian production hits new high with daily average in April of 406,700 bbl., in May of 396,290 bbl. . . . ¶Trans-Arabian Pipe Line gets right-of-way through Trans-Jordan and Lebanon. . . . ¶Venezuelan Embassy in Washington announces government's royalty oil is available for sale and invites offers from "responsible parties." . . .

PRICES— OPA rules natural gas and petroleum gas come under Moore decontrol amendment. . . . Holds decontrolled petroleum products include those normally made by oil refiners but not petroleum-derived specialties manufactured by others. . . . ¶OPA discloses investigations of petroleum pricing violations instituted before June 30 will be continued. . . . Price official says $437,822 collected since March, 1945, as penalties in 115 cases of petroleum price violations at wholesale levels. . . . ¶Texas Producers and Royalty Owners Association executive committee goes on record in opposition to stripper-well subsidy. . . . Decision on future rates of payment until April 1 still awaited from Washington. . . . ¶Department of Commerce survey shows average cost of drilling a well in the United States has jumped 77 per cent in the last 7 years. . . . ¶Residual prices advance in California. . . . Mid-Continent gasoline market shows some signs of easing. . . .

REGULATION— Views of State Department officials on need for international oil-control body under United Nations aired in week-end broadcast. . . . Importation of half the country's oil within 20 years seen by John A. Loftus, chief of the department's petroleum division; Charles B. Rayner, department petroleum adviser, and Col. G. H. Vogel, ANPB executive officer. . . . Vogel says military considering reserving additional oil areas in this country. . . . Remarks draw rebuttal from Senator O'Mahoney who says no such shortage exists as to "cause it (the United States) to become embroiled. . . . In the Near and Middle East." . . . ¶Loftus' earlier University of Pittsburgh talk in which he outlined an international oil control body which could review existing oil contracts brings sharp criticism from industry leaders in New York. . . . Objections reported registered direct with State Department. . . . ¶Reaction to discussion of another government official, Secretary of Interior Krug, at Interstate Compact meeting varies from censure to praise. . . .

A row of wells is being drilled up the right-of-way of the Illinois Central Railroad in Coles County, Ill., as a part of renewed activity which is completing development in the heart of Mattoon field. Menhall Drilling Co., Benton, Ill., has the right-of-way lease and is doing the drilling on the railroad property. The offset to the left is being drilled by Keating Drilling Co. for Carter Oil Co. The rig on the right-of-way is specially designed to be operated in the 16-ft. space between the track roadbed and the right-of-way line. An article of the Mattoon development will appear in an early issue in the Journal's engineering section

What Others Say

On these pages are presented the reactions of representative oil industry leaders to the remarks made by Secretary of the Interior Krug August 10 at the Interstate Oil Compact Commission meeting in Grand Rapids, Mich. In his first major address before an oil-industry group, Krug said the industry must "accommodate its thinking" to the need for substantial imports and called for a "climate of economic circumstances which will assure a vigorous and healthy American oil industry." His address was carried in abridged form on page 67, August 17 issue of The Oil and Gas Journal.

Talk Outlines Sound Objectives For National Petroleum Policy

Sirs:

Secretary Krug it seems to me has outlined sound objectives for a national petroleum policy. As I interpret these objectives, Krug believes: (1) That the domestic oil industry must remain strong and virile. (2) That the highest producing efficiency must be a continuing major goal of the industry. (3) That imports may be necessary and should be available to make up the difference between the nation's demand and its available domestic supply when obtained under sound conservation practices. Under such a policy the American oil industry can remain strong, can continue to meet effectively and efficiently the needs of consumers,, and can keep itself in a position to serve effectively in the case of any national emergency.

E. HOLMAN,
President, Standard Oil Co. (N. J.)

Statement Gives Rise to Fears Of Damaging Import Policy

Sirs:

Some day I wish a government official dealing with oil would make a statement something like this:

"The oil industry of the United States must have the first opportunity to supply the petroleum needs of the United States at fair prices. The Government will encourage an adequate price, promote improved technique in finding, producing, refining and using petroleum, and encourage the development of synthetic fuels. Imports will only be permitted in amounts necessary to supplement the domestic supply or to furnish special products."

Such an atmosphere would give great encouragement to the oil industry. Statements on imports such as those made by Secretary Krug cause the producer to fear the Government will embark on a program of imports that leaves no hope for his future.

I realize the secretary said we should have a strong domestic oil industry, but I also know that for the past 5 years we have been living under governmental interpretations of what was an adequate supply of materials and an adequate price. There is no reason to believe that same kind of thinking would not prevail in the interpretation of a strong domestic oil industry.

When Mr. Krug made his statement it demonstrated very clearly to me the value that the National Petroleum Council can be to the Government, the oil industry, and the citizens of this country. With the proper atmosphere at the council meetings and the proper relationship with the secretary of the interior, either the industry will convince the secretary he is wrong, or he will convince the industry he is right.

RALPH T. ZOOK,
Sloan & Zook, Bradford, Pa.

Problem of Imports Requires Balance of Two Viewpoints

Sirs:

Secretary Krug raises the old question of imports. This problem is not so simple as it may seem to a casual observer.

True, we should preserve our own oil resources, as much as practicable, by imports. But an import policy which would discourage our search for new oil reserves might place us in a precarious situation in case of another emergency. In case of emergency there would be no time for exploration and finding of new reserves, no time for drilling wildcat and producing wells. Potential, but unfound, reserves would have done us no good in World War 2.

If imports unduly depress the price of crude oil, will not this hold back the development of production of liquid fuels from gas, as well as discourage the finding of our oil reserves?

No, the problem is not a simple one. It requires a balancing of long-run and short-run points of view. We cannot afford to give up our self-sufficiency in the next 20 or 30 years in order to have more oil a hundred years from now. There seems far more hope for a peaceful world, under a limited, federal, world government, a hundred years from now than in the near future.

Wisely, Mr. Krug takes no categorical position. He merely poses the problem. But in dealing with that problem we cannot afford to confine our attention to the long-run view and ignore the welfare and safety of our country in the intermediate period.

W. T. HOLLIDAY,
President, Standard Oil Co. of Ohio.

Flood of Cheap, Imported Oil Dangerous to Nation's Welfare

Sirs:

Secretary Krug's address at Grand Rapids was frank and straightforward. I agree with him that a strong domestic petroleum industry is necessary in the public interest and for the future security of the nation. The domestic industry cannot remain strong, however, if a flood of cheap imported oil is permitted to supplant domestic production. We would then become dependent on foreign sources of supply and the nation's economy and security would both be jeopardized.

Production quotas should be established by the various state regulatory bodies which are consonant with good conservation practices, and then, if necessary, our domestic production should be supplemented by reasonable import quotas which would meet our requirements.

A policy on this subject vitally affects the national interest and is deserving of careful study by the Congress with appropriate legislation.

B. A. HARDEY,
President, Independent Petroleum Association of America.

Secretary Reemphasizes Points Stressed Earlier by Industry

Sirs:

Secretary Krug's address to the Interstate Oil Compact Commission meeting at Grand Rapids reemphasized the validity of points which the oil industry has had great difficulty in convincing certain of the federal agencies dealing with petroleum. I refer to the following quotation: "Expert opinion indicates we have about reached the half-way mark in oil discovery in the United States. Finding the second half will take much longer, be much more difficult and far more costly."

If the Department of the Interior follows through on its program to provide a "vigorous and healthy climate of economic circumstances," there can be little doubt that its progress will be of great service to the industry and to the nation as a whole. No thinking American citizen can object to importation of oil so long as such imports do not interfere with the continued progress of our domestic industries.

WILLIAM T. PAYNE,
President, American Association of Oilwell Drilling Contractors.

Import Policy Would Be Like "Turning Back the Clock"

Sirs:

On the whole, Secretary Krug's statements of national oil policy are not at great variance with the concensus of opinion within the industry. However, his reference to the necessity of our reliance on foreign imports will bring forth a serious issue and one that is vital to the healthy advancement of our domestic industry.

This is not the first time that ominous predictions have been put forth that we were running out of oil in this country. Following World War 1 it was freely prophesied that America was facing an imminent shortage of oil; but, that has not materialized. On the contrary, the petroleum industry has met this challege by producing crude and petroleum products in sufficient quantities to provide the oil ammunition not only for our own fighting forces but for our Allies as well. While this extraordinary demand was being fulfilled, our domestic reserves continued to increase. This record speaks for itself.

If the Government will permit the petroleum industry to go forth as a free industry with the removal of price controls and the restoration of a free economy under the competitive system that gave birth to the industry, there will be no threat to our national security from a shortage of oil. There is every reason to believe that there are ample reserves yet to be discovered in our own country if the industry is given reasonable opportunity to carry on its program of development. This, however, cannot be done if the American oil industry is to be hamstrung by governmental restrictions that deny a free play of the factors that have brought the petroleum industry to its present high peak of performance in discovery of reserves and the manufacture of products of the highest efficiency.

It would be like turning back the clock for this nation to depart from its former

course and to establish a policy that would encourage a permanency of oil imports for our economic dependence.

W. S. HALLANAN,
President, Plymouth Oil Co.; temporary chairman, National Petroleum Council.

Healthy, American Industry Termed a Constructive Goal

Sirs:

Secretary Krug's address before the Interstate Oil Compact meeting indicates his intention to clear the way for a "healthy, vigorous American petroleum industry." That is a constructive program. Mr. Krug will find that this industry will cooperate with the Government to conserve petroleum resources, extend its use, and continue wide exploration so long as it is assured that enterprise and progress are not to be penalized, and the American oil industry is not placed in an unfavorable competitive position with foreign companies. The industry demonstrated its sound Americanism in the war and is equally able to meet the complex problems of peace.

RALPH B. LOYD,
President, Western Oil and Gas Association.

Shell Oil's New Crude Postings Detailed

According to its crude oil price bulletin 10, which includes price advances as of July 25, Shell Oil Co., Inc, is paying the following per-barrel prices for crude purchased in the given areas:

West Texas—New Mexico area—$1.05 per barrel for 20° and lower gravity with 2-cent differentials to $1.47 for 40° and above gravity crude. This area includes Andrews, Crane, Ector, Gaines, Howard, Glasscock, Irion, Pecos, Upton, Winkler, Yoakum, and Ward counties, Texas, and Lea County, New Mexico. Exception for the area is crude oil produced from Ellenburger (Ordovician) formation in the Wheeler-Ellenburger pool, Winkler County, Texas; Monahans-Ellenburger pool, Ward County, Texas; TXL-Ellenburger pool, Ector County, Texas; Bedford-Ellenburger pool, Andrews County, Texas; and crudes purchased in the Yates (Deep) and Taylor-Link pools, Pecos County, Texas.

Prices for the West Texas area start at $1.18 per barrel for 20° and below gravity and increase by 2-cent differentials up to $1.60 for 40° gravity and above. Pools included in this area are Wheeler-Ellenburger, Winkler County; Monahans-Ellenburger, Ward County; TXL-Ellenburger, Ector County; and Bedford-Ellenburger, Andrews County, produced from the Ellenburger (Ordovician) formation in such pools.

Louisiana Gulf Coast is divided into two areas in Shell's postings. First of the areas under the heading of Louisiana Gulf Coast include Black Bayou (light), Chalkley, Gibson, Goodhope, Happytown, Iowa (light), LaPice, Roanoke, South Houma, St. Gabriel (K sand type), Weeks Island, West Lake Verret, and White Castle (high cold test) pools. Prices for this group begin at $1.28 per barrel for 20° gravity and below and increase upward by 2-cent differentials to $1.70 for 40° gravity and above.

Included in the second section of Shell's division of the Louisiana Gulf Coast area are Black Bayou (heavy), Iowa (heavy), White Castle (low cold test), and St. Gabriel (F sand type) pools. Prices posted for this area start at $1.41 per barrel for 20° gravity and below and increase by 2-cent differentials up to $1.83 for 40° gravity and above.

East Texas, Livingston, and Mercy pools are posted at a flat price of $1.60 per barrel. Yates (deep) and Taylor Link pools are also posted on a flat price basis at $1.60 per barrel.

Petroleum Club Formed By New Orleans Group

NEW ORLEANS.—A Petroleum Club of New Orleans, which will occupy clubrooms in the Roosevelt Hotel beginning October 15, has been organized here, it was announced last week by R. L. Keyes, division manager of The Texas Co. and president of the new organization.

Temporary offices for the club have been set up in the Whitney Building where membership applications are being received. Resident membership will total 150, and non-resident, 100. Initial organization of the club was carried out under the direction of Robert L. Humphrey, division tubular representative of Oil Well Supply Co.

Other officers are: Harold C. Teasdel, vice president, The California Co., vice president; Harry Fotiades, independent producer, treasurer; Dr. Gordon I. Atwater, chief geologist of William Helis, secretary. Other members of the board are: C. C. Clifton, Louisiana division superintendent, Humble Oil & Refining Co.; H. Grady Meador, division manager, Gulf Refining Co.; Reese E. Carter, Lynn Oil Co.; Robert L. Humphrey, Oil Well Supply Co.; William Helis, Jr.; Earl Bateman, drilling contractor, and D. T. McIver, general manager, Freeport Sulphur Co. Kenneth Crandall, president of The California Co., is chairman of the finance committee, and Robert L. Humphrey is chairman of the house and entertainment committees.

California Concern Buys Well Equipment Company

HOUSTON.—Purchase of Well Equipment Manufacturing Co. located here by Chiksan Co. of Brea, Calif., was announced last week by W. Edgar Spear, president of the California company. Operation of the Houston company will be continued as a wholly owned subsidiary of the Chiksan Co.

All export sales will be handled by Chiksan Export Co., and an interchange of manufacturing facilities is anticipated. Sale of the Well Equipment company resulted from the desire of C. A. Stillwagon, president, to retire, officials of the company said. He will remain with the company one year in an advisory capacity.

Phillips Plans Gulf Coast Gas Distillate Plant

HOUSTON.—Plans for Phillips Petroleum Corp. to build a $2,000,000 gas-distillate plant at Chocolate Bayou south of Houston were disclosed here last week.

The announcement was made at a party given in Houston by Phillips to signalize the company's entrance in the Gulf Coast sales field. It was attended by several hundred dealers, jobbers, and Houston business leaders.

K. S. Adams, Phillips president, told the group that Phillips had "for a long time been operating production, land, and geological facilities in the Gulf Coast area. We are happy to announce our entry in the sales field." Headquarters for Phillips Gulf Coast marketing activities will be in Houston.

Petrochemical Chemistry Expanding in Texas

AUSTIN.—Manufacture of specialty chemical products from petroleum or natural gas hydrocarbons is expanding rapidly in Texas.

Among the new plants are three which will be in operation early next year. A fourth product is the new $3,000,000 petroleum research center of the Celanese Corp. of America at Corpus Christi which is to be placed in use within the next few weeks. The Celanese center, an outgrowth of the corporation's chemical plant at Bishop, Tex., near Corpus Christi, will employ about 300 technicians and other workers.

Du Pont is erecting a $30,000,000 plant at Orange, Tex., for the manufacture of chemical intermediates for nylon. At Port Neches, Tex., Jefferson Chemical Co. is building a plant which will also make chemical intermediates from gases supplied by the near-by refinery of The Texas Co. The third plant is that to be built by American Cyanamid at Port Neches for manufacture of a variety of industrial chemicals.

Stanolind Office Moved

Stanolind Oil Purchasing Co. has transferred its general superintendent's office from Tulsa to Cushing, Okla. All matters pertaining to operation and maintenance of tank farms, except at Beaumont, Tex., will be handled through the Cushing office, it was announced. Roy T. Thompson is general superintendent.

Land Restrictions Lifted

WASHINGTON.—Lifting of war-imposed restrictions upon development and use of more than 18,600,000 acres of public land in Alaska was announced last week by J. A. Krug, Secretary of the Interior. The areas, located in the Alaskan Peninsula and the Katalla-Yakataga region of the Kanai Peninsula in the southwestern part of the territory, were withdrawn from public use in 1943 as part of the Government's program for the development of possible petroleum supplies for the armed forces.

International

WORLD-WIDE OIL DEVELOPMENTS

First Shipload of Middle East Oil Docks at Philadelphia

by Warren W. Burns

PHILADELPHIA.—From the desert coast of Kuwait on Persian Gulf, the first shipload of Middle East crude ever to reach the United States pushed through a heavy mist and docked here at the Gulf Oil Corp.'s Gerard Point terminal, Sunday, August 18, at 7 a.m.

On hand with the writer to watch the "S.S. Yellow Tavern"—carrying 115,000 bbl. of crude from the Sheikdom of Kuwait—pull alongside the dock was Gulf's marine department general manager, Willard F. Jones. The arrival of this tanker may well mark the birth of a new era in the international movement of crude oil.

A short talk with the Yellow Tavern's captain, A. J. Zera, indicated that the arrival of his ship at Fahaheel, located 30 miles south of the city of Kuwait, was the second tanker to load Kuwait crude. The first, an Anglo-Iranian Oil Co., Ltd., operation earlier this year, took its load to Anglo-Iranian's Grangemouth refinery in Scotland. The Kuwait Oil Co., Ltd., is jointly owned and operated by Anglo-Iranian and Gulf Exploration Co., a subsidiary of Gulf Oil Corp.

Captain Zera pointed out that docking facilities at Kuwait are still in the pioneering stage, and this, coupled with monsoon weather in the Red Sea, cut down his time on the return trip to Philadelphia. The trip, however, was completed, via the Suez Canal, in something less than 25 days. Shortly, a radio station is expected to be constructed at Fahaheel to aid docking operations, but in the meanwhile an Anglo-Iranian tugboat will continue to relay messages.

The Kuwait loading is done by a gravity process, with the crude coming from two 139,000-bbl. (each) loading tanks 5 miles west of the village on top of a 300-ft. ridge. Loading of the Yellow Tavern took 12 hours at the approximate rate of 10,000 bbl. per hour. Two more loading tanks, of equal capacity, are now being constructed, and plans are being made to construct 18 more sea-loading berths at Fahaheel.

Gulf Refining Co.'s general manager of manufacturing, T. J. Sullivan, stated that on August 26 the Kuwait crude will be given a test run through a refining unit with a daily rated capacity of 28,000 bbl. The straight-run gasoline and naphtha will be taken off, with the naphtha then being polyformed to obtain high-octane gasoline.

After taking off Nos. 1 and 2 fuel oil, the cracking stock will be run through a fluid catalytic unit to manufacture high-octane gasoline and fuel oil. Then, the gases from the fluid catalytic unit will be processed at the alkylation plant for high-octane blending components.

The Kuwait crude showed at 31° (A.P.I.) gravity when tested aboard ship en route. It is generally thought, however, that the crude ranges from 32° to 36.4° (A.P.I.). It is a mixed base with about 2 per cent free sulfur. The crude comes from Kuwait's Burgan field, located about 50 miles southeast of the Fahaheel (Ahmadi tank farm) and daily production is said to be around 30,000 bbl. daily, with the output coming from six dual-zone producers.

Allied Distributing Body Set for German Zones

NEW YORK.—Plans for the formation of an Allied-controlled joint petroleum distribution agency in the U. S. and British zones in Germany are now being made. This agency, which may be known as the Allied Petroleum Service Organization (APSO) probably will be similar to the postwar petroleum organization already formed in the Philippines and Japan. (See Oil and Gas Journal, July 6, page 60, and July 13, page 70).

While the cooperation of the French may be sought in this new setup, indications are that France will reject this specific proposal as quickly as she recently rejected the all-embracing U. S. proposal for an economic merger of the French zone with the U. S. and British zones in Germany.

The U. S. and British-controlled German oil organization probably will go a step further than the Japanese setup and provide for the private oil companies, participating in the organization (APSO) to handle civilian as well as military oil needs. U. S. and British oil companies interested in the APSO plan are: Standard Oil Co. (N. J.); Anglo-Iranian Oil Co., Ltd.; Asiatic Petroleum Corp.; Socony-Vacuum Oil Co., Inc., and possibly Atlantic Refining Co.

While it is unlikely that the British will favor the participation of oil companies—in the British zone, anyway—which did not have some sort of prewar oil connections in Germany, it is known that efforts will be made to see that at least one other company, California Texas Oil Co., Ltd., is allowed to become an APSO partner. Caltex is a participant in both the military controlled oil organizations in the Philippines and Japan.

Previous Distribution Unsatisfactory

Petroleum distribution methods in Germany, during the past year, have been anything but satisfactory, according to reliable sources here who have recently been in Germany, and it is hoped that the formation of APSO will create greater efficiency until the peace with Germany is signed. At present, private oil companies are prevented from doing business in Germany under the "Trading With the Enemy Act"—and technically, Germany is still an enemy.

Whether oil companies will even be allowed to resume competitive operations immediately after the peace treaty is signed — which probably won't be for at least another year—is problematical. In the case of Japan, General MacArthur's office has pointed out that the economic con-

ditions there are so disrupted that "it will be long after 1948" before private companies will be allowed to return to anything resembling prewar operations.

As Germany's current estimated demand for all petroleum products—in all four zones—is now 42,500 bbl. daily, and as the daily estimated refinery output is around 20,000 bbl., it is clearly evident that more than half of the demand will, for the imdiate future, continue to be imported as refined products. However, it is known that the rebuilding of some damaged refineries in Germany is generally favored, but just how many and on what basis is not known. Ostensively, APSO, which will be under the jurisdiction of the Army-Navy Petroleum Board, will be intersted only in distribution. But if ANPB follows its implied efforts to aid U. S. oil interests, it is believed that Army officers concerned with foreign oil problems will continue to aid private interests in resuming normal operations. Lt. Col B. D. Farnham, director of ANPB's distribution division, is slated to hold a conference shortly in Frankfurt to discuss over-all APSO plans.

While prewar oil consumption figures in Germany are generally not regarded as any too accurate, well-informed international sources in New York estimate the 1938 consumption to have been around 155,000 bbl. daily. By 1950 it is estimated that German consumption will be 85,000 bbl. daily. The prewar daily refining output (exclusive of synthetic production) has been estimated at 48,000 bbl.

Trans-Jordan Authorizes Arabian Line Right-of-Way

NEW YORK. — The Trans - Jordan Government has given permission for the trans-Arabian crude pipe-line right-of-way through that country to the Trans-Arabian Pipe Line Co., according to a spokesman here of the Standard Oil Co. of California, which owns 50 per cent of the Trans-Arabian company along with The Texas Co.

However, definite plans for the Mediterranean terminus of this 1,200-mile line have not yet been made, it was pointed out, despite the recent report from Cairo that Egypt's Chamber of Deputies had been informed that the terminus would be either at Alexandria or Port Said.

Trans-Arabian also has permission for right-of-way through Palestine, but in the case of Trans-Jordan's right-of-way permit, the company will pay that country approximately $250,000 yearly. The Palestine concession is free of charge, as Government officials there state that the people stand to benefit generally from this industrial undertaking.

Trans-Arabian has also signed a right-of-way agreement with Lebanon, a copy of which had not yet reached this country as of late last week.

Las Mercedes-Guanta Line In Venezuela Considered

NEW YORK. — Preliminary plans for the construction of a 135-mile pipe line from Venezuela's Las Mercedes field to the Caribbean port of Guanta—a few miles east of Puerto de la Cruz—are now being considered. Whether this line will be 14-in. or 16-in. depends solely on the production of the Las Mercedes field where the Las Mercedes Oil Co. now has about 30 wells shut in, with more being drilled.

Las Mercedes Oil Co. is owned by Texas Petroleum Co., a Texas Co. subsidiary, and Caracas Petroleum Co., owned by private British oil interests. Crude from Las Mercedes is not expected to be on the world market before 1948.

Venezuelan Government Invites Royalty Offers

WASHINGTON.—The Government of Venezuela wishes it to be known that the royalty accruing to the nation from the production of the Venezuelan oil fields may be available in kind, and sold to responsible parties, the Venezuelan Embassy here announced this week.

All propositions for the purchase of the royalty or of any part of it must be addressed to the Encargado del Ministerio de Fomento, Caracas, Venezuela, and should state clearly the advantages offered, over and above the prices which the producing companies are paying or would pay to the Government, under present regulations for the computation of the value of the royalty, the announcement said.

The Venezuelan Embassy in Washington will furnish upon receipt a table showing the producing fields, the corresponding types of oil, the quantities available in royalty during the month of May, the value per barrel for that month under present regulations, and the ports of embarkation.

The total royalty crude oil available to the Venezuelan Government in the month of May 1946 amounted to 4,384,000 bbl. This ranged from Bachaquero crude to 14.6° A.P.I. gravity to 47.8° Cumarebo crude.

Iranian Production Reaches New High

NEW YORK.—Two new highs in Iranian crude production were reached by Anglo-Iranian Oil Co., Ltd., during April and May when the output totaled 1,743,000 tons (12,201,000 bbl.) and 1,755,000 tons (12,235,000 bbl.) Daily average in April was 406,700 bbl.; in May, 396,290 bbl., respectively, according to company figures just released here.

The April and May figures compare with February's output of 1,496,000 tons (10,472,000 bbl.) and the March output of 1,717,000 tons (12,019,000 bbl.) Daily average in February was 374,000 bbl.; in March, 387,709. The company's Abadan refinery, situated at the northern end of the Persian Gulf, is now running a little over 400,000 bbl. on an average.

Construction work to expand the 85,000 bbl. daily refinery of Consolidated Refineries, Ltd., at Haifa, to a point where it will handle in excess of 100,000 bbl. daily are progressing. Consolidated is jointly owned by Anglo-Iranian and Anglo-Saxon Petroleum Co. (Shell), and obtains its crude from Iraq's Kirkuk field. Also under construction at Haifa is the installation of a lubricating oil plant which will handle 5,000 bbl. daily of finished lube oils.

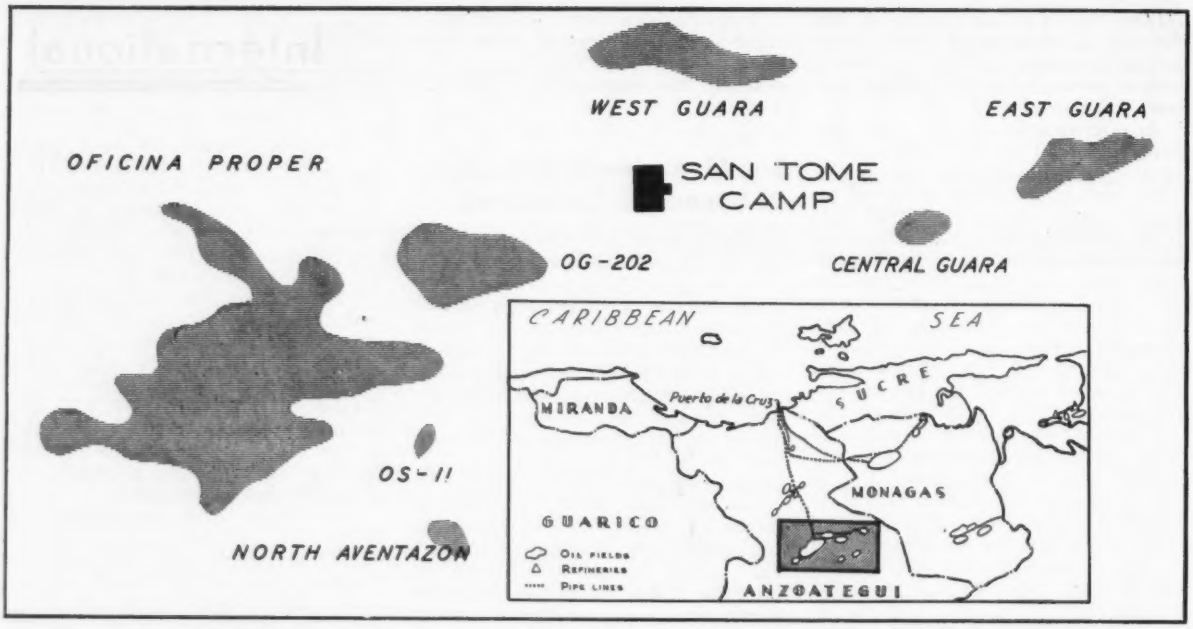
Three U. S. Oil Officials Leave for Europe

NEW YORK.—To study the oil situation in Italy and to seek aid in obtaining crude for Italian refineries, W. B. Uderski, fuel branch chief of the United Nations Relief and Rehabilitation Administration, left the United States last week for Rome.

Accompanying Uderski were Robert Eakens, assistant chief of the State Department's Petroleum Division, and Lt. Col. B. D. Farnham, director of Army - Navy Petroleum Board's distribution division. Eakens will go later to Switzerland to study the recently organized Russian-Swiss oil combine, and Farnham to Germany to discuss the formation of an Allied oil organization there which will embrace U. S. and British oil companies.

Shell Rebuilding Refinery

THE HAGUE. — Operating at a daily capacity of 400 tons (2,800 bbl.) during April, the N. V. Bataafsche Petroleum Maatschappij (Shell) refinery at Rotterdam is gradually being rebuilt, following severe damage to its installation during the war. Prewar throughput of this refinery was approximately 15,000 bbl. daily. Production from the war-discovered Coevorden field was around 26 tons (208 bbl.) daily. Since V-E Day, the field has produced 7,200 tons (50,400 bbl.)



Map showing West Guara and others fields in the Greater Oficina area, Eastern Venezuela

Many Sands, Variety of Crudes Complicate Exploitation in West Guara, Venezuela

by Paul Reed

A NUMBER of problems are encountered in seeking an explanation for the peculiar conditions in West Guara field—one of the largest fields in the entire Eastern Venezuela basin. A large variety of crudes is not only found within the field, but there are numerous crudes in different segments of the same formation and several crudes are produced from certain individual segments.

There is a general trend in any area of West Guara for A.P.I. gravities to be low in the deepest producing lenses than in the shallowest. This is contrary to gravity trends generally in Venezuela and elsewhere. However, the trend does not follow consistently from lens to lens in a given area of West Guara field.

Mene Grande's present share in the field represents a potential of 60,000 bbl. daily with wells on relatively small chokes. Current production is about 43,000 bbl. daily with a number of wells shut in. The other company in the field, Socony-Vacuum Oil Co., Inc., of Venezuela, has been producing 8,000 to 10,000 bbl. daily.

West Guara field is in the Greater Oficina area which also includes the Oficina and East Guara fields, both entirely operated by Mene Grande Oil Co. Mene Grande production figures as of January 1, 1946,* follows (figures in barrels):

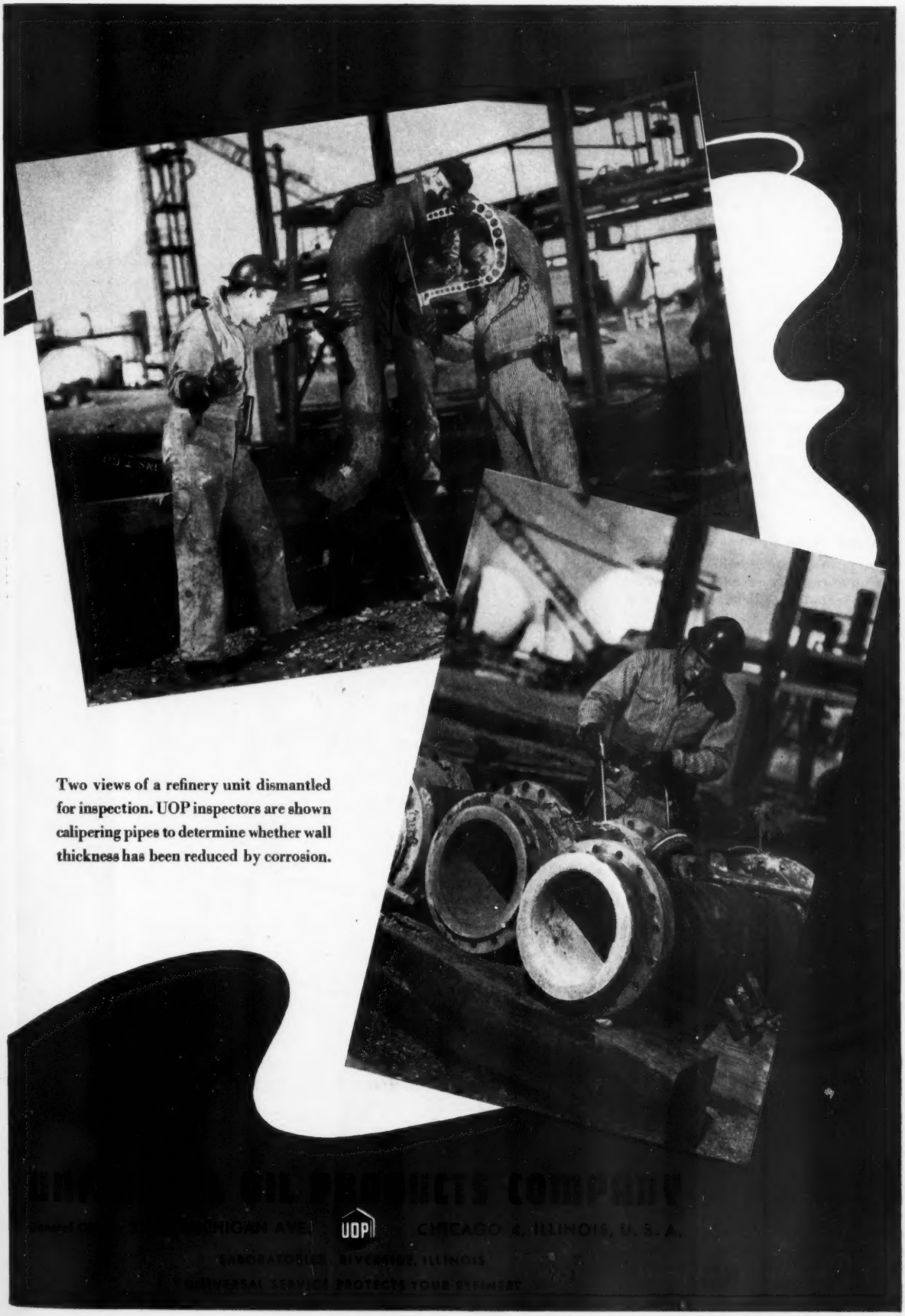
Field—	1945 production	Cumulative production
Oficina	15,260,000	94,138,000
East Guara	4,295,000	6,268,000
West Guara (MGO only)	14,038,000	20,771,000

*Eastern Venezuela's production in 1946 has been greater than in 1945.

Production from the Greater Oficina area is all from the Oficina formation of Miocene age. The area lies on the southern flank of the Eastern Venezuela basin and toward its eastern end. This basin can be considered as both structural and depositional with the reservoir rock of the Oficina formation being more or less broad sheet-like bodies of sand rising gently and rather uniformily southward and southwestward out of the basin. The effective barriers of migration which are responsible for oil accumulation are: (a) Faults with a trend approximately normal to the direction of the dip in this part of the basin; or (b) lateral decreases in permeability; or (c) actual pinching out of strata updip.

(Continued on page 70)

This article on producing operations in West Guara field, Venezuela, is another resulting from a 3 months' South American trip earlier this year by Paul Reed, the Journal's pipeline editor and engineering staff writer. Reed's first report on his observations was "Guarico's 1946 Exploration Program Is Most Extensive in Venezuela," published March 16 in The Oil and Gas Journal. Others appearing in the Journal were "Creole Starts Research Department to Study Exploration and Production," May 4; "Venezuela's Largest Chemical Emulsion Treating Plant," May 11; "Oficina Field Is Scene of Venezuela's First Water-Flooding Experiment," May 18; and "Socony-Vacuum Explores Barinas, Venezuela's Largest Concessions," August 8.



Two views of a refinery unit dismantled for inspection. UOP inspectors are shown calipering pipes to determine whether wall thickness has been reduced by corrosion.

UOP

CHICAGO 4, ILLINOIS, U. S. A.

All of the Greater Oficina fields contain a number of extremely lenticular productive sands. Consequently porosities range from practically zero upward to over 30 per cent. Permeabilities also vary correspondingly. Most of the sands in the West Guara field are blanket sands and have relatively high permeabilities, both horizontal and vertical.

Formation dip of West Guara field varies from 2° to 4° with a gradual steepening occurring with depth. In East Guara it varies from 5°-15°, but in Oficina it is usually less than 2°.

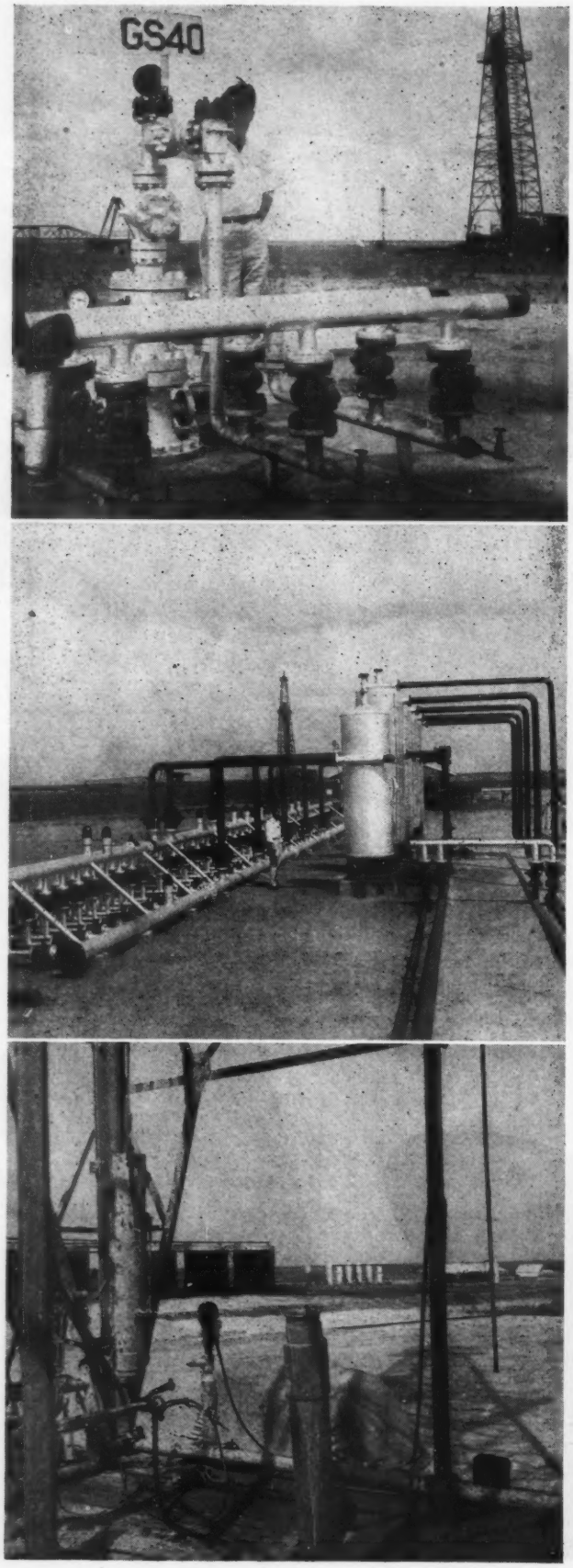
Experience from the Oficina field has shown a recovery in some reservoirs higher than would normally be predicted as being recovered from solely a solution gas-drive. Gravity drainage is believed responsible for this additional recovery, which in some instances will be considerable. West Guara with its higher gravity oil in the upper sands and hence low viscosities, combined with high sand permeabilities and greater dip of the producing strata, will provide very favorable conditions for gravity drainage.

Outpost Wells Promise Extension

Two outpost wells drilled early this year have promise of extending West Guara so that it will be of great significance in the reserves of Eastern Venezuela. One of these wells is Mene Grande's GM-4, located 4.6 km. (about 2.9 miles) somewhat south of west of the westernmost West Guara well. Although the accumulation is against another fault, production may extend to West Guara field proper. Structure drill work indicates it should extend a mile still farther westward. Socony-Vacuum's test GV-32, 4 km. (about 2½ miles) northwest of the field, has indications of being a good producer north of the West Guara fault.

In the Oficina field there are 33 producing sands (37 have been produced there); in West Guara, 31 producing sands; in East Guara, 21 producing sands. In addition to the 31 producing sands, West Guara has 15 sands yet to be exploited, three dry and water sands and eight tar sands, totaling 57 sands. Producing sands are found between 4,300 and 7,800 ft.

West Guara crudes are as follows:



Far right: Typical log of West Guara field. Crude oils varying widely in gravity are produced from a large number of sands. Top picture: Triple completion well in West Guara field. Center: Gathering station with high and low-pressure separators, header providing for testing individual wells, and pipe-line pump station (in background). Manifold piping was fabricated at the San Tome shops of Mene Grande Oil Co. Bottom: View of gathering station including tanks, separators, and pump station as seen from derrick floor of drilling rig of Mene Grande Oil Co.

(a) Light waxy crudes, (Oficina five through C sands) with gravities ranging from 37°-58°, wax content 6 to 12 per cent; (b) nonwaxy crudes, D_1 through Mu sands, gravity range 20°-42° A.P.I.; (c) tar oil sands below Mu with gravity range +10°-18°.

An example is cited to indicate how gravities of oil differ in the same reservoir. The upper part of a cored section of a 35-ft. sand body in the Oficina field yielded cuts of 26° A.P.I., the middle portion 18°, and the lower part 10°. When a formation test was made, with all but the upper 5 ft. open below the packer, 18.5° oil flowed at the surface. With casing cemented above the sand and perforated liner opposite the entire sand, the well initially produced 23.2° gravity oil. Gradually the gravity increased to 28.5°, then after considerable production, decreased to 26°. The well has since been off production.

Gravities Decrease With Structure

Gravities of many of the heavier oil reservoir (below 30°) in both the Oficina and West Guara fields tends to decrease with structure. A number of the reservoirs have gravities grading down to +10° residual tar oil from as high as 26° near the gas cap. The reservoir from which the well just referred to is producing had gravities as high as 36.9° at the high point of the structure, while a well only 65 ft. lower produced as low as 23.2° (18.5° in formation test). Intermediate wells produced intermediate gravities.

A well in the F_5 reservoir of West Guara near the water-oil contact tested 22.1° oil while 34 ft. and 175 ft. higher, wells tested 26.5° and 33.9° oil respectively. Still farther updip, cores indicated gravities of from 36-40°. A second West Guara reservoir had crude gravities as high as 26.5° near the gas cap, while 18° oil was produced 100 ft. downdip. Immediately below this and above the water-oil contact the oil degenerates into a tar or residuum oil.

The Oficina field consists of a number of separate reservoirs for each horizon due to a complex fault system. As many as six from one horizon are productive of oil, each with a different gravity, in the Oficina field proper. Correlation throughout the field is excellent. Gravities from one sand vary as much 24°, or from 18° to 42°, from one fault segment to another. In the Oficina field these fault segments are usually relatively widely separated. However, adjacent wells (350-meter spacing) but separated by faulting, produce different types of crude entirely as well as different gravity in one horizon. One well tested 38° wax oil (15-20 per cent wax) and the other produces 29° nonwaxy oil.

Within productive limits of West Guara field the West Guara fault ranges in displacement from 175 to 500 ft. The throw increases with depth, and it is only in wells which are cut deep in the section that have over 400 ft. of section cut out.

Production Mainly North of Faults

Accumulation is found on the north sides of these faults whether they are upthrown or downthrown to the north. In all fields of the area some production is found on both sides of these faults, but that on the south side is spotty and has relatively little importance. In East Guara field, where the main fault has around 900 ft. of displacement, production was obtained above and below the fault in the same well section. Additional faulting to the south is suspected although it may be due to a stratigraphic trap. In West Guara only gas has been found south of the main fault.

WEST GUARA FIELD COMPLETIONS (Mene Grande operated).

Triple zone	Dual zone	Single zone	Total
32	58	2	92

Future trend will be toward more dual-zone wells and fewer triple-zone wells. The main reason for this is that the Guara district will soon be drilled up and multiple-sand fields of this type are not found very frequently. The greater control over reservoir conditions and better flowing characteristics of single and dual-zone wells will also be a big factor.

Comparative Data of Triple and Dual Completions

All gages were taken during the same month from wells in the same reservoir with all producing through ¼-in. chokes. Sand conditions throughout were comparable:

Conduit—	No. wells	Average BPD
2-in. tubing	8	418
Annulus 2-in. and 4-in. tubing strings	13	387
Annulus 4-in. tubing and 7-in. casing	5	341
Annulus 2-in. tubing and 5½-in. casing (dual wells)	17	340

Triple-zone equipment was used in the Guara district primarily to increase production to meet pipe-line requirements and to conserve steel. During 1943 Mene Grande was faced with the problem of filling a 100,000-bbl. pipe line (greater Oficina share) with only about 45,000 bbl. of current production. In West Guara, Mene Grande had three wells drilled and one in East Guara. Mene Grande had quite a number of undrilled locations in the Leona field, but that is essentially a one-sand field and the pays are deep. The long transportation haul was also a factor for not drilling in this field.

Production Boosted for War Needs

With the limited amount of personnel, casing, bits, drilling rigs and transportation, West Guara was the logical place to step up production in order to meet the Mene Grande share of the wartime requirements. Productive sands are relatively shallow, drilling offers no problems. Many of the wells were drilled with drag bits entirely or with plugged wire-line hard-head core bits. The field was close to the main terminal at San Tomé. Drilling in West Guara was resumed with one rig in August 1943. A second rig was picked up the following month. By April 1944 only four rigs could be assembled for West Guara drilling. Four more were picked up by August 1944, which was the maximum number that Mene Grande ever employed in the field at one time. Five strings of tools are now drilling. The following table shows the daily average production buildup for Mene Grande's portion of the field.

DAILY AVERAGE PRODUCTION (BBL.)

November 1943	August 1944	August 1945	December 1945
5,100	21,800	41,800	44,900

Mene Grande's portion of the field now has a potential of 60,000 bbl. daily with wells on relatively small chokes. Current production is about 48,000 bbl. daily with a number of wells shut in. When it is considered that wells were producing on larger chokes in August 1944 as compared to a year later, the increase is all the more pronounced. The first triple-zone well was completed during the latter part of August 1944. From then on until Mene Grande ran out of equipment, a large percentage of all wells were completed in this manner. The Mene Grande organization is convinced that without triple-zone wells they would never have been able to meet wartime requirements with the equipment they had on hand at the time.

Equilateral Triangle Grid Used

Development of the Guara district, where most of the drilling has been in the past few years, was carried out on a 770-m. (about 2,500 ft.) primary equilateral triangle grid system —the simple aliquot breakdown of the grid yield drainage areas of 126.8, 42.3, 31.7, 14.1, 10.6, 7.9, 4.7, etc. acres. Development proceeded on the 42.3-acre grid [444.4-m. (about 1,450 ft.) surface spacing] until it was apparent that Mene Grande could not drain most of the sands on this spacing. The grid was further broken down to 14.1-acre spacing [256.6-m. (about 840 ft.) spacing] in the most prolific portions of the field, but a 42-acre reservoir spacing was still maintained in most of the field.

The above development only applied to sands below 5,400 ft. in West Guara field, but when production was obtained from above this, it was necessary to have a further breakdown.

BUILT-IN DEPENDABILITY!

FOR YEARS, General American has been precision fabricating equipment to handle the various gases, liquids and bulk materials used by refineries.

It has excellent X-ray facilities, heat treating and stress-relieving furnaces and experience in fabricating equipment of carbon, stainless, alloy steels, Everdur, Hastelloy, Monel, aluminum and clad materials.

Put this experience to work on your next plate fabrication assignment by asking for our recommendations and quotation.

Other General American Equipment

TANKS . . .
- WATER
- GASOLINE
- ACID
- PROPANE
- BUTANE
- CHLORINE
- BLENDING
- MIXING
- CRUDE

TOWERS
- ABSORBERS
- BUBBLE
- FLASH
- VACUUM
- FRACTIONATING
- PRESSURE

DEWAXING FILTERS
STACKS – BINS
STEEL PLATE FABRICATION

General American
TRANSPORTATION CORPORATION
process equipment • steel and alloy plate fabrication

SALES OFFICE:
514b Graybar Bldg., New York 17, N. Y.
WORKS: Sharon, Pa.; East Chicago, Ind.

GAT-X GENERAL AMERICAN TRANSPORTATION

OFFICES: Chicago, Louisville, Cleveland, Sharon, Orlando, St. Louis, Salt Lake City, Pittsburgh, Washington, D. C.

WASHINGTON WATCHING

BY HENRY D RALPH

Interpretation of Decontrol

WASHINGTON. — Petroleum products, in the view of the Office of Price Administration, are only those products usually made in oil refineries and do not include minor products or byproducts often made in other plants even though they may be derived from nothing but petroleum.

This is OPA's interpretation of the Moore amendment to the new price control act, which says: "Nothing in this act shall be construed to authorize the Administrator to impose or maintain price controls with respect to petroleum or petroleum products processed or manufactured in whole or substantial part from petroleum."

OPA says this means that price controls no longer apply to natural gas produced from a gas well not associated with crude petroleum at the time of production, petroleum gas, defined as any refinery gas or vapor produced in conjunction with crude petroleum, or a petroleum product generally manufactured or processed by petroleum refiners.

Under this interpretation products such as gasoline, kerosene, naphthas, fuel oils, greases, petroleum coke, lubricating oils, asphalt, and petroleum road oil are exempt from price control.

On the other hand, products which are manufactured from petroleum generally by other than petroleum refiners are not exempt from price control. Such products would include synthetic butyl alcohol, industrial alcohol, and others generally regarded as in the chemical field. This decision has no effect on any other action OPA may have taken regarding price controls on petroleum chemicals. For instance, some time ago OPA suspended ceilings on ordinary channel or carbon black and premium blacks selling for 6 cents or less at the manufacturing level.

The High Cost of Drilling

THE average cost of drilling an oil or gas well in the United States rose from $16,529 in 1939 to $29,217 in 1945, an increase of 76.76 per cent in 7 years.

This is the conclusion of David L. Siskind of the construction division of the Office of Domestic Commerce, Department of Commerce, in a study of capital expenditures in the oil-well drilling industry published in the August issue of the Department's "Domestic Commerce."

The figures were obtained by an analysis of construction cost data compiled by the Census Bureau, which reported that capital expenditures by the drilling industry were $455,386,000 in 1939 and $741,071,000 in 1945. The author reported that figures on drilling costs are difficult to obtain because the industry paid little attention to costs until it came under wartime price control.

The study does not include costs of exploration, but discusses various factors influencing drilling costs and recent trends in costs of deeper drilling and input wells for secondary recovery.

The Draft Problem Again

THE draft of technical men and key executives will again be a problem for the oil industry in September when the Selective Service System must supply the Army with 25,000 men between the ages of 19 and 29.

In order to meet its call for 225,000 men by April 1, Selective Service has instructed its local draft boards to reduce occupational deferments to the barest minimum, and to defer only those individuals determined to be absolutely "indispensable and irreplaceable to national existence."

The American Chemical Society has taken the lead in seeking modification of this policy, taking the position that young scientists are vitally necessary to industry at this time, both in research and in plant operation. A.C.S. contends that no individual under 29 can be classed indispensable and irreplaceable to national existence, so the practical results will be that the draft boards will strip industry of all physically fit nonfathers under 29 regardless of their key importance to a plant.

Some relief is promised from a compromise recently agreed to by Selective Service under which an employer can request the deferment of key men under a certification plan similar to that used during the war. When an employe is called up before the draft board the employer may fill out a deferment application on Form 42-A, filing it with the Office of Scientific Research and Development if the man is engaged in research or technical work, and with the Civilian Production Administration if he is a key production executive.

This procedure will not get into operation until the draft calls start in September, but it is not expected to result in the deferment of more than a very few individuals shown to occupy really key essential positions.

New U. S. Ownership Issue

A NEW battle over federal ownership of oil and gas lands, companion to the tideland issue, was outlined by President Truman last week when he signed a bill reorganizing many of the Government's agricultural credit activities into a Farmers' Home Corporation.

He issued a statement saying he has "grave concern" over section 9 of the act which provides that "any conveyance of real estate by the Government or any government agency under this act shall include all mineral rights."

"I do not concur with the objectives of this provision," the President said, explaining that it is particularly important that the Government retain ownership and control of fissionable material under the atomic energy act. Then he added:

"It is equally important that the Government reserve ownership of oil, gas, and other minerals critical to the national defense and economy. Many of these minerals are both scarce and of vital importance to the country. Where the Government is disposing of lands which may contain these minerals, it should safeguard their prudent development by a reservation of mineral rights."

Congressional Battle Looming?

A forecast of a Congressional battle came in the President's warning that in the future "I shall be extremely reluctant to approve legislation containing clauses which threaten to whittle away governmentally owned mineral resources. It is my hope that at its next session Congress will take speedy action to repeal Section 9 of this act, together with the similar provision in Section 4 of Public Law 563 of the Seventy-ninth Congress, which I reluctantly approved on July 30, 1946, for like reasons."

Government land acquisitions have increased rapidly since the depression through foreclosure of loans on homes and farms, various soil conservation, rural rehabilitation, wildlife refuge, and other programs, and during the war large tracts were purchased by

the Government for training camps, airfields, and other military purposes. In reselling these lands it has become a rather general policy to reserve all mineral rights, disposing of the surface only.

The President's statement was immediately challenged by Representative Ed Gossett of Wichita Falls, Tex., who declared that Mr. Truman must have had some bad advice from bureaucrats.

Vitalizing the Leasing Act

TENTATIVE regulations under the new Hatch-O'Mahoney oil and gas leasing act, just approved by the President, are now being drafted by the Bureau of Land Management of the Interior Department, and public hearings will be held on them in Denver, Colo., about the end of September or first of October.

The law makes many changes in the leasing act, requiring a virtual rewriting of the oil and gas regulations pertaining to operations on public lands. Prior to the public hearings the BLM hopes to publish its tentative regulations so as to get the comments and suggestions of the industry before they are officially promulgated.

Public-Land Production

THE Geological Survey has compiled some statistics on its public-land leasing operations during the fiscal year which ended June 30, 1946, showing the government lands produced 59,567,525 bbl. of petroleum, 96,070,275,000 cu. ft. of natural gas, and 120,819,733 gal. of gasoline and butane.

Comparable production figures for the previous fiscal year were 55,907,088 bbl. of petroleum, 95,920,557,000 cu. ft. of natural gas, and 127,922,745 gal. of gasoline and butane. The survey declared that the increase in crude production "sharply reflects the results of the department's all-out effort to produce minerals for war."

Pacific Coast Residual Prices Up; New York Reports Shortage

by Dahl M. Duff

THE position of residual fuel oil held attention in petroleum market circles on both East and West Coasts early this week.

In an adjustment to reflect demand, refinery yields, and cost of manufacture, residual prices jumped 10 cents per barrel at Pacific Coast points except Seattle and Portland where the advance was 15 cents. Simultaneously, bunker diesel fuel prices dropped 40½ cents per barrel with a new quotation at Los Angeles harbor of $2.20 per barrel.

In New York, suppliers were talking greater imports as the solution to meet residual demand. Several dealers said their supplies are barely sufficient to meet the needs of regular customers. No residual was reported available in the open market, despite an upward trend of stocks.

Companies Reduce Heavy Fuel Oil

Two companies in the New York area said they are cutting back on heavy fuel oil output because it is uneconomical under the present prices. These companies expanded catalytic cracking facilities during the war, enabling them now to augment yields of the more remunerative lighter products. One New York market source said the recent 20-cent boost in residual price had no appreciable effect on residual output, being less than the amount of the crude advance.

The gasoline market in the interior was showing some signs of easing. Slackening purchases by major companies—heavy buyers throughout the summer—were reported. Regular generally moved at 6¾ cents, though some was reported available at 6⅝ cents. Some premium grade was going at 7½ cents. Natural gasoline continued its upward climb, advancing another ¼ cent to 4½ cents in 26-70 grade in Oklahoma.

Though the reports of an easier market in the Mid-Continent area foreshadowed the end of the season of heaviest demand shortly after Labor Day, consumption of motor fuel continued high for the present. In the New York harbor, price for regular stood at 7.75-8.5 cents. In California, shipments of motor fuel to all classes of trade reflected the peak summer consumption by motorists, commercial accounts, and by the marine trade. Higher-level prices inaugurated August 1 appeared well supported, and the fringe of the supply volume offered a fraction below regular levels was not regarded as a threat to the market structure.

DEATHS

William D. Shaffer, 69, president of Shaffer Tool Works, Brea, Calif., died suddenly August 6. He had been ill with an ailing heart, but his death was unexpected because it had been thought that a period of rest would restore him to good health. His son, Donald U. Shaffer, has been actively managing the firm for some time. Shaffer was born in Springtown, N. Y., February 16, 1877, and after living in Iowa for some years, he went to Tacoma where he met his wife, Mrs. Edna U. Shaffer, who survives him. They were married in Santa Paula in 1901. He started his career when he became a superintendent of an oil-tool shop in Olinda, Calif. In 1923 he became a partner with William Travers and Frank Schweitzer in Brea Tool Works. Later the business was sold and Shaffer subsequently started the company which today bears his name. Shaffer was a 32nd degree Mason and a member of the Al Malaikah shrine. He was mayor of Brea for a period of over 8 years and active in the Lions Club, having served as its president. He took active interest in civic and church affairs and was a trustee of his church for many years. In addition to his wife, he is survived by his son, Donald U. Shaffer, two daughters, and two sisters.

A. J. Cunningham, Houston, president of Standard Oil Co. of Texas since its reorganization in 1941, died August 20 in El Paso, Tex.

Howe Walker, 54, vice president and general sales manager of Hughes Tool Co., died August 14 in Houston. Walker, who had been associated with Hughes Tool since 1919, was made general sales manager of the company after he returned to Houston in January from Tulsa where he had been special representative.

Burr B. McWhirt, 57, oil evaluation engineer with the Bureau of Internal Revenue, died recently at his home in Washington. Before going to Washington in 1937, he was an oil evaluation engineer in Texas and Oklahoma.

William H. Pullman, 57, membership secretary of the Texas Mid-Continent Oil & Gas Association, died August 19 in Dallas.

Melvin B. Davis, oil operator and one of the founders of the Panhandle Producers and Royalty Owners Association, died August 18 in Pampa, Tex.

Reed D. Beardsley, 77, retired Standard Oil Co. (Ind.) official, died August 19 in Colorado Springs, Colo.

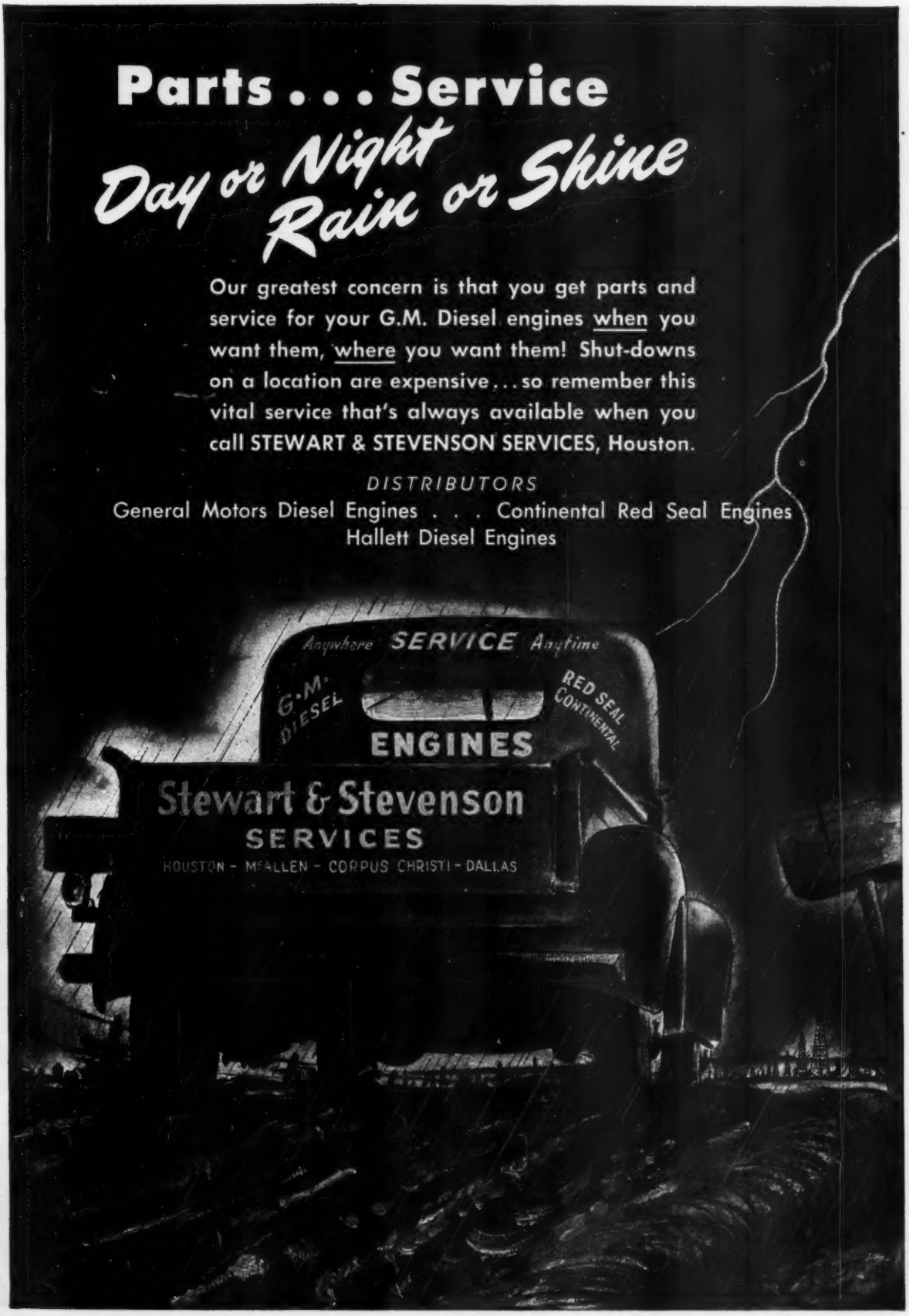
Parts . . . Service

Day or Night Rain or Shine

Our greatest concern is that you get parts and service for your G.M. Diesel engines when you want them, where you want them! Shut-downs on a location are expensive . . . so remember this vital service that's always available when you call STEWART & STEVENSON SERVICES, Houston.

DISTRIBUTORS

General Motors Diesel Engines . . . Continental Red Seal Engines
Hallett Diesel Engines



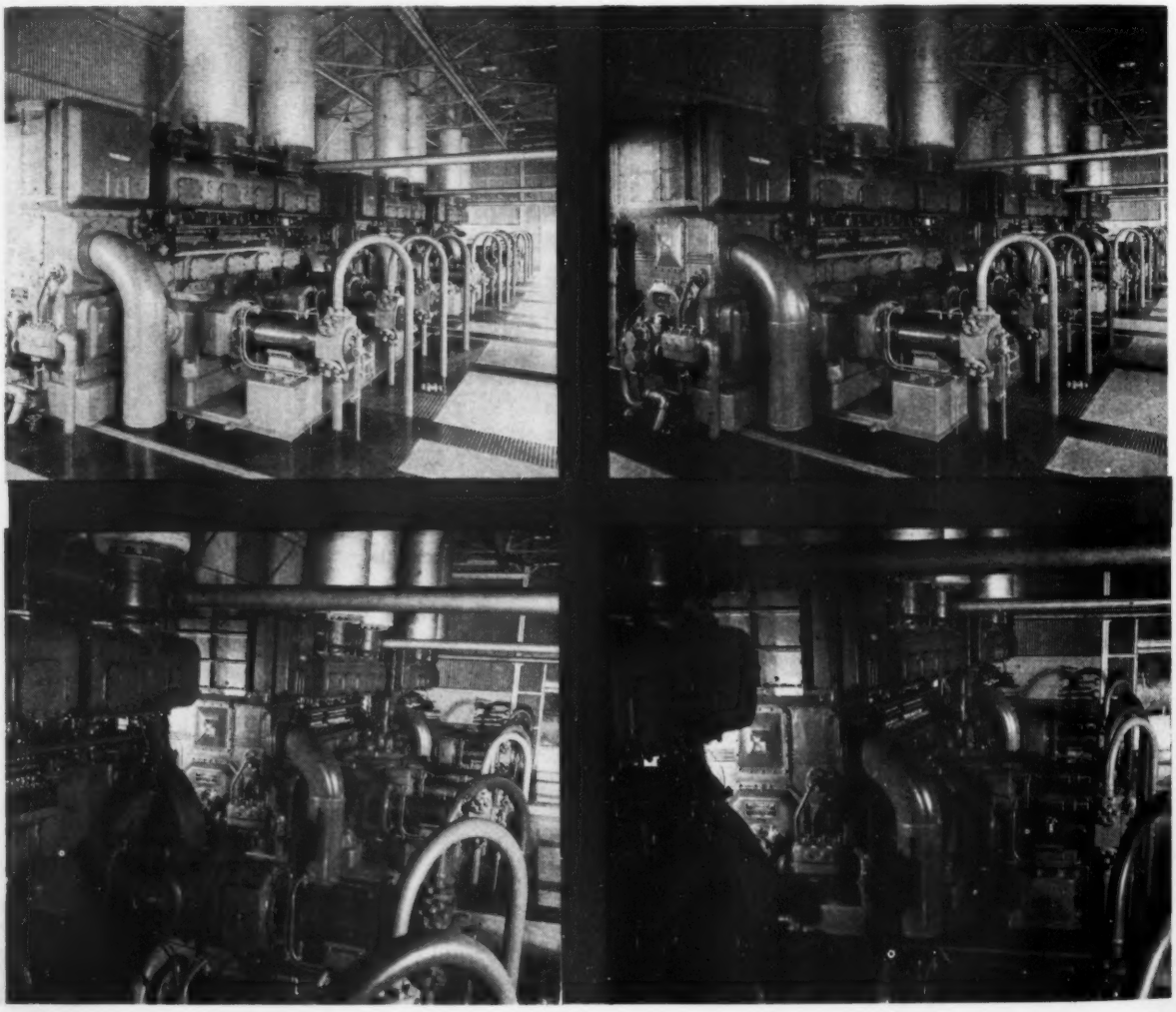
Production Trend In Lone Star's

This article reviews the changes which have occurred in material treated, in products made, and field-operating conditions during the 6 years' existence of the plant. Production has declined in the interval from 80,000 to 23,000 gal. liquid products per day

STARTING on June 28, 1940, with seven wet gas wells and one injection well, Lone Star Gasoline Co.'s Grapeland recycling plant has produced tremendous quantities of natural gasoline, naphtha, and kerosene, and has cycled billions of cubic feet of dry gas back in formation. It is interesting to note changes which have appeared in material treated, in products made, and in the conditions under which the field is operated as it grows older, on its way to becoming uneconomic for operation as it has been operated these 6 years.

The plant was designed originally to handle for recycling 50 million cubic feet of gas per day at 1,700 psig., and to produce about 2,000 bbl. per day of total liquid product. Its design, shown diagrammatically in Fig. 1, includes two high-pressure absorbers, and one low-pressure absorber or reabsorber; an evaporator and a dephlegmator tower; depropanizer and debutanizer towers, and a butane-splitter tower; a naphtha or kerosene side stripper, an absorption-oil reclaimer; five 125-b.hp. Oil Country boilers; three three-stage

General views and close up of Worthington compressors in Grapeland plant



Grapeland Recycling Plant

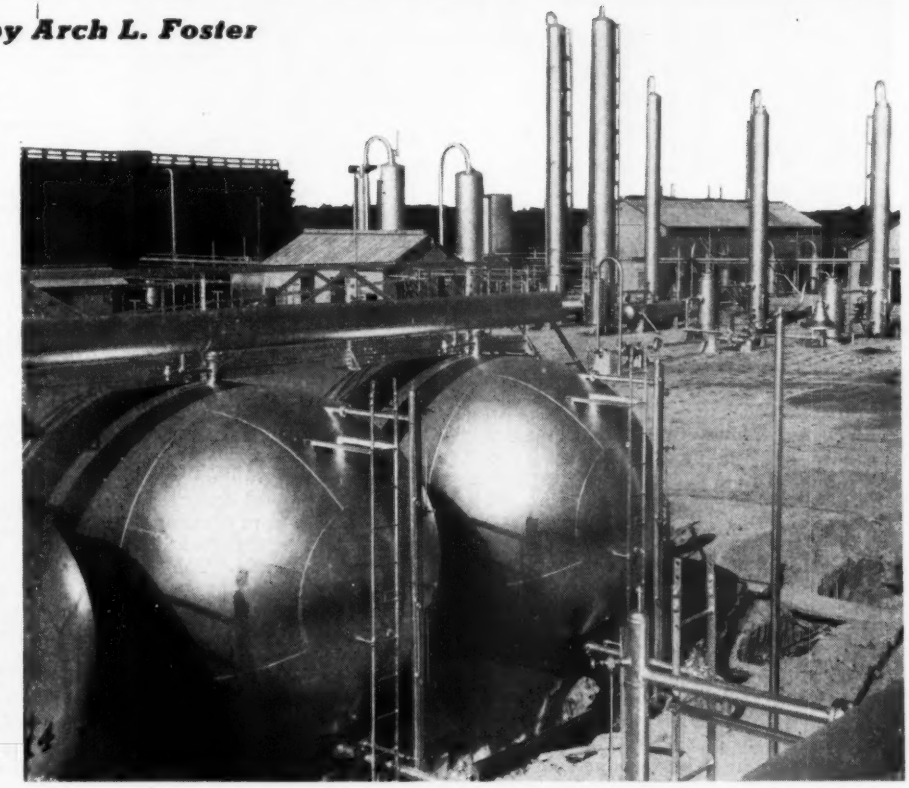
by Arch L. Foster

Worthington compressors, and one recompressor (165-hp.); along with the multitude of auxiliary equipment necessary to operate the unit.

Operation of the Plant

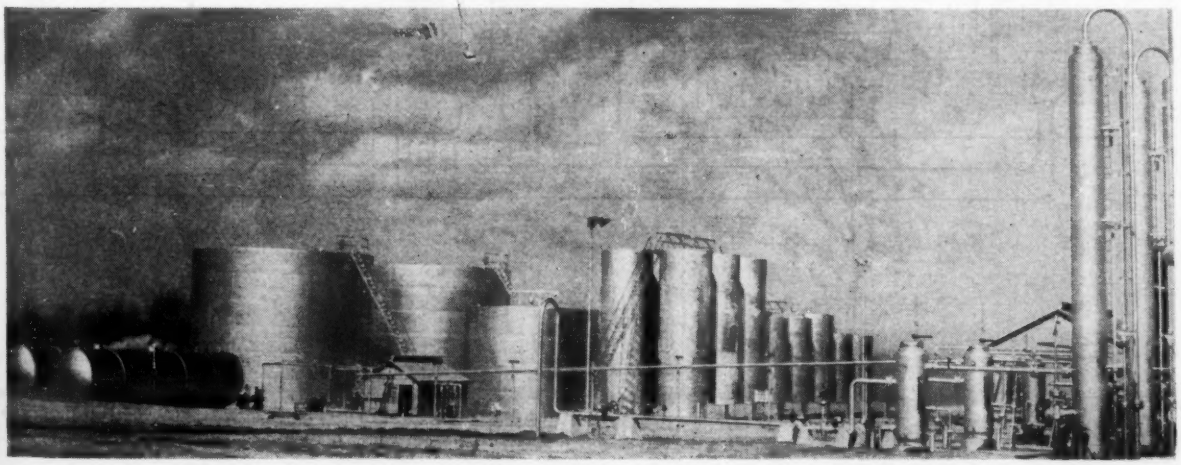
The plant is located on the Smith tract, about 3 miles northwest from Grapeland, Tex. Intake pressure varied not more than 100 psi. during the period of 1940-1946, being about 1,600 p.ig. at the start and about 1,500 psig. at the end of the period. The discharge pressure of the compressors to the injection well ranged from 2,500 psig. at the beginning to about 2,400 psig. at the end of this period.

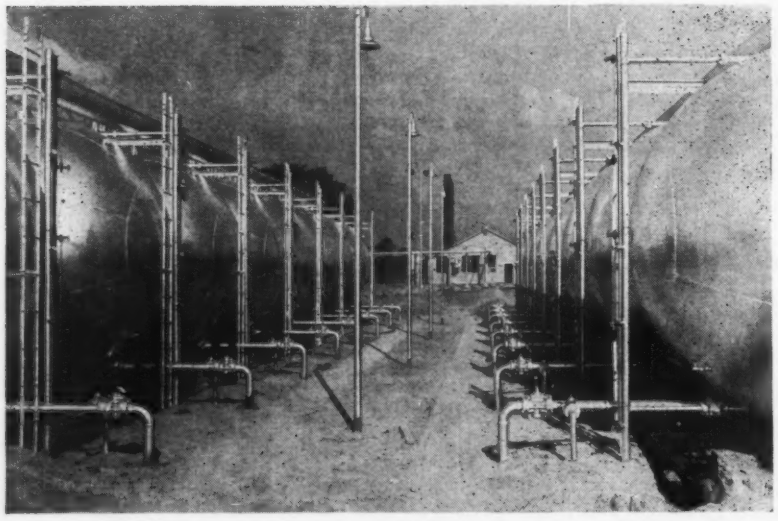
Raw wet gas enters the plant through two high-pressure inlet separators from the bottom of which condensate—or distillate—liquid is withdrawn for further processing. Overhead from the separators the gas streams, essentially distillate free, enter near the bottom of two parallel high-pressure absorbers, operating at 1,650 psig. The absorption oil made in the plant as a fraction from the distillate, is picked up from the bottom of the evaporator, through the heat exchangers and oil cooler and is admitted to the absorber tops Fat oil is withdrawn at the absorber bottoms and passes to the rich-oilvent. The stripped gas from the top of the absorbers is returned to the high-pressure residue scrubbers, there to



Over-all view of the Grapeland plant. Light-product storage in foreground

Pressure and atmospheric storage assembly at Grapeland plant.





Twin battery of pressure storage tanks at Grapeland plant

TABLE 1—DAILY AVERAGE PRODUCTION OF LIQUID PRODUCTS

Year and month—	Daily avg. prod. in gal.
1943:	
April	80,000
June	72,000
August	70,000
October	70,000
1944:	
January	68,000
April	57,000
June	43,000
September	50,000
December	38,000
1945:	
April	32,000
June	35,000
September	22,000
December	18,000
1946:	
March	23,000

TABLE 2—GAS PROCESSED, AND GAS REINJECTED 1943 TO 1946, AVERAGE PER DAY

Year and month—	Cu. ft. gas processed	Cu. ft. gas reinjected
1943:		
April	77,000,000	66,000,000
June	78,000,000	65,000,000
September	87,000,000	66,000,000
December	87,000,000	65,000,000
1944:		
April	83,000,000	63,000,000
June	84,000,000	64,000,000
September	76,000,000	66,000,000
December	76,000,000	63,000,000
1945:		
April	71,000,000	57,000,000
June	72,000,000	52,000,000
September	62,000,000	45,000,000
December	62,000,000	54,000,000

be picked up by compressor suction and raised to 2,500 psig. and sent to the injection well.

Vaporized material from both the distillate and rich-oil vent tanks is led to the bottom of the (low-pressure) reabsorber, meeting a stream of lean absorber oil. This stripped vapor or gas passes to the low-pressure residue scrubber, thence to such other uses as may need it, such as engine and boiler fuel, flare, etc. The rich oil from the reabsorber bottom joins that from the rich-oil vent in passing through exchangers and picking up heat from stripped oil and from steam to enter the top of the evaporator at about 360° F. This step strips the rich oil of its gasoline components, steam being used to add the necessary heat, raising the bottom temperature to about 384° F. The lean-oil stream from this evaporator bottom is split, a portion of it passing to the reclaimer column where the clean oil is vaporized and recondensed to separate it from decomposition products and sludgy material formed during its cycle. The reclaimed oil is passed to storage, the refuse material to a burner or other disposal means.

Overhead vapors from the evaporator or still enter the lower section of the dephlegmator tower. Overhead of this tower pass the raw natural-gasoline vapors; reflux liquid is formed in a primary condenser, while the bulk of the gasoline is condensed in the secondary condenser and is caught in the "raw make" accumulator. From the side of the dephlegmator a stream is withdrawn and stripped in the side-stripper tower. Overhead from this tower pass the vapors of a naphtha cut which are condensed and the naphtha passes to gasoline storage. The bottoms from

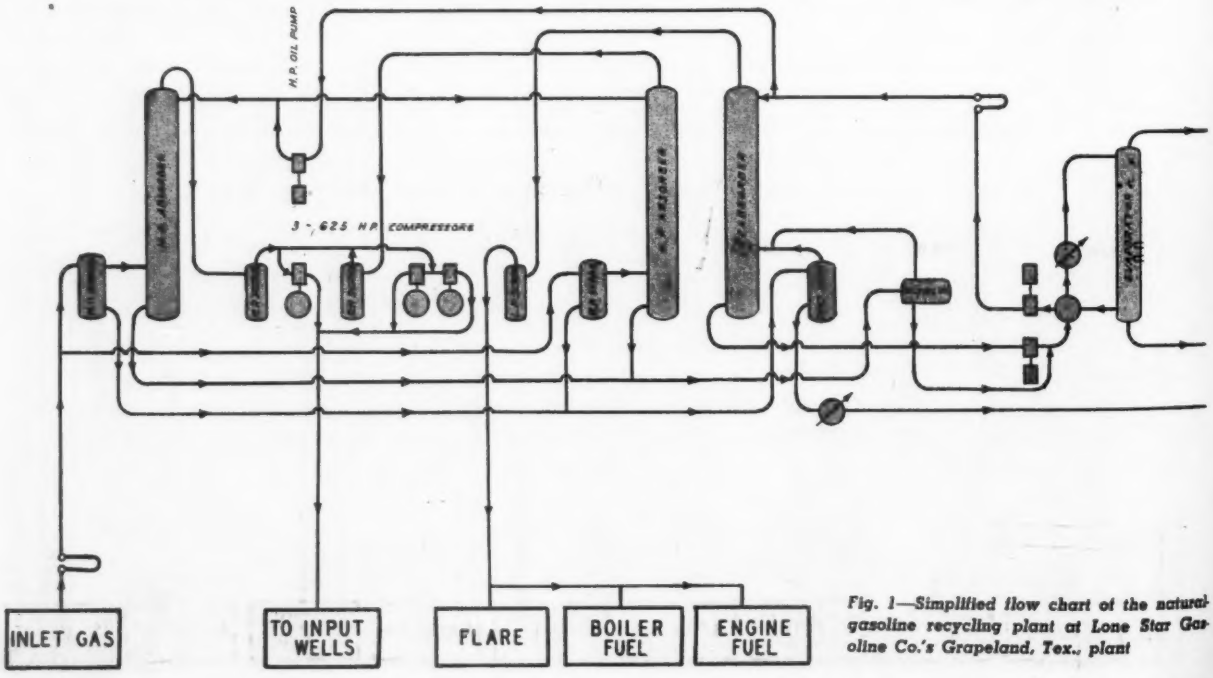


Fig. 1—Simplified flow chart of the natural-gasoline recycling plant at Lone Star Gasoline Co.'s Grapeland, Tex., plant

TABLE 3—ANALYSES OF DIFFERENT PRODUCTS

Component—	Percentage by volume
July 1942:	
Motor fuel:	
C_3S	7.66
i-C_4	10.14
n-C_4	13.22
C_5+ heavier	68.88
Isobutane concentrate:	
C_3	8.53
i-C_4	26.71
n-C_4	64.76
Kerosene:	
None	
January 1943:	
Motor fuel:	
i-C_4	0.17
n-C_4	10.92
i-C_5	14.38
n-C_5	9.87
C_6+ heavier	64.66
Isobutane concentrate:	
C_3	2.03
i-C_4	96.50
n-C_4	1.47
Normal butane:	
C_3	4.16
C_3	16.38
i-C_4	1.12
n-C_4	78.34
Kerosene:	
C_6+ heavier	100.00

the side-stripper tower are kerosene which is cooled and stored.

Raw natural gasoline is picked up from the accumulator mentioned above, is heated in exchange with debutanizer bottoms and flashed in the depropanizer. Overhead from the depropanizer the light vapors containing ethane and propane are partially condensed to yield required reflux for the tower and the remainder pass to such other use or disposal as may be desirable.

Depropanizer bottoms are heated with steam and are flashed in the debutanizer column. The overhead product vapors, mixed butanes, are condensed and split in a deisobutanizer or butane-splitter column, from which overhead vapors are condensed and sent to isobutane storage. The normal butane bottoms from the splitter may be mingled with the natural gasoline or stored separately for separate disposal, as desired.

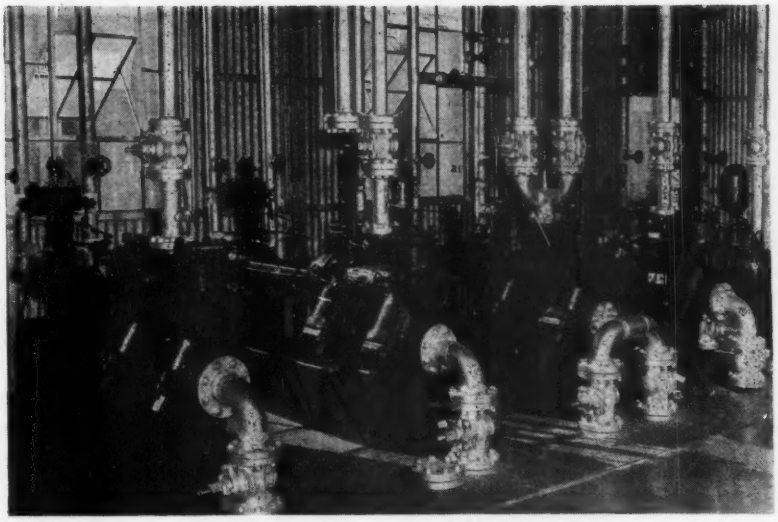
All condensate and exhaust steam from pumps, etc., is returned to the condensers at the boiler house and reused in the steam generators, only makeup water being required. The boiler load is practically constant at 800 b.hp. per hour. With a production of 20,000 gal. per day this means a requirement of about 33.12 lb. of steam per gallon of product.

Table 1 shows the gradual decline of production in this field from 1943 to the present, in daily average production in the months indicated.

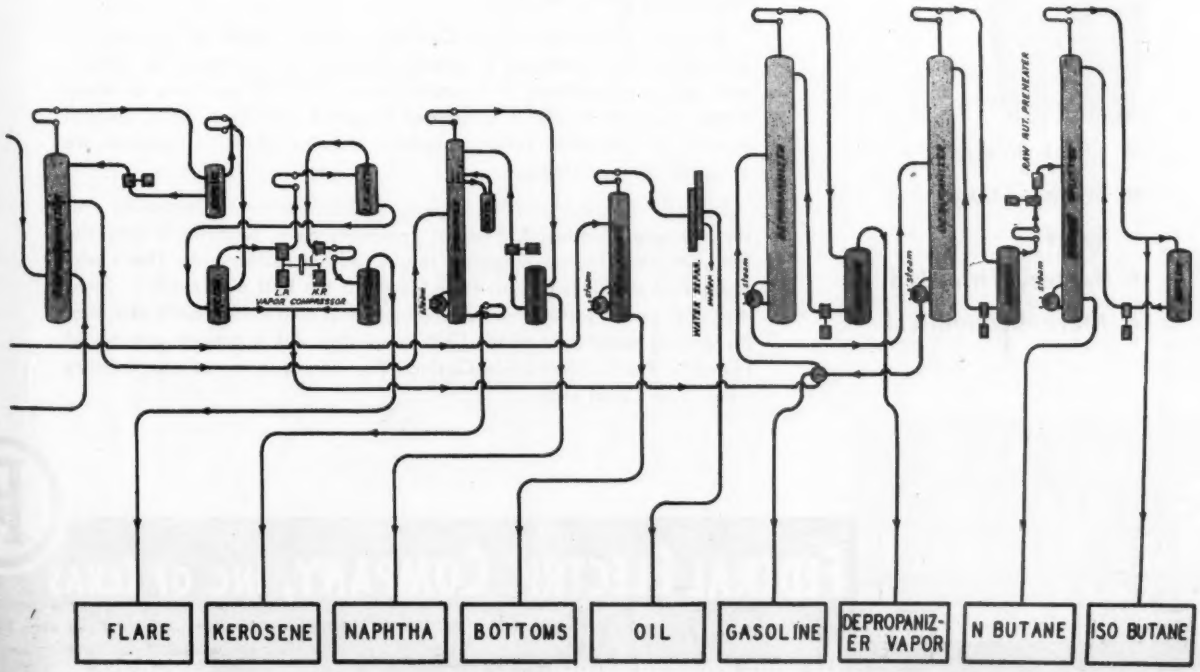
During the same period the following quantities of raw gas were passed through the system, and the quantities of stripped gas were reinjected as shown in Column 4, Table 2.

The difference between the amounts of raw gas processed and the amounts of reinjected includes the amounts of dry gas used for plant fuel, for drilling and other field fuels, and the volume reduction caused by the hy-

(Continued on page 95)

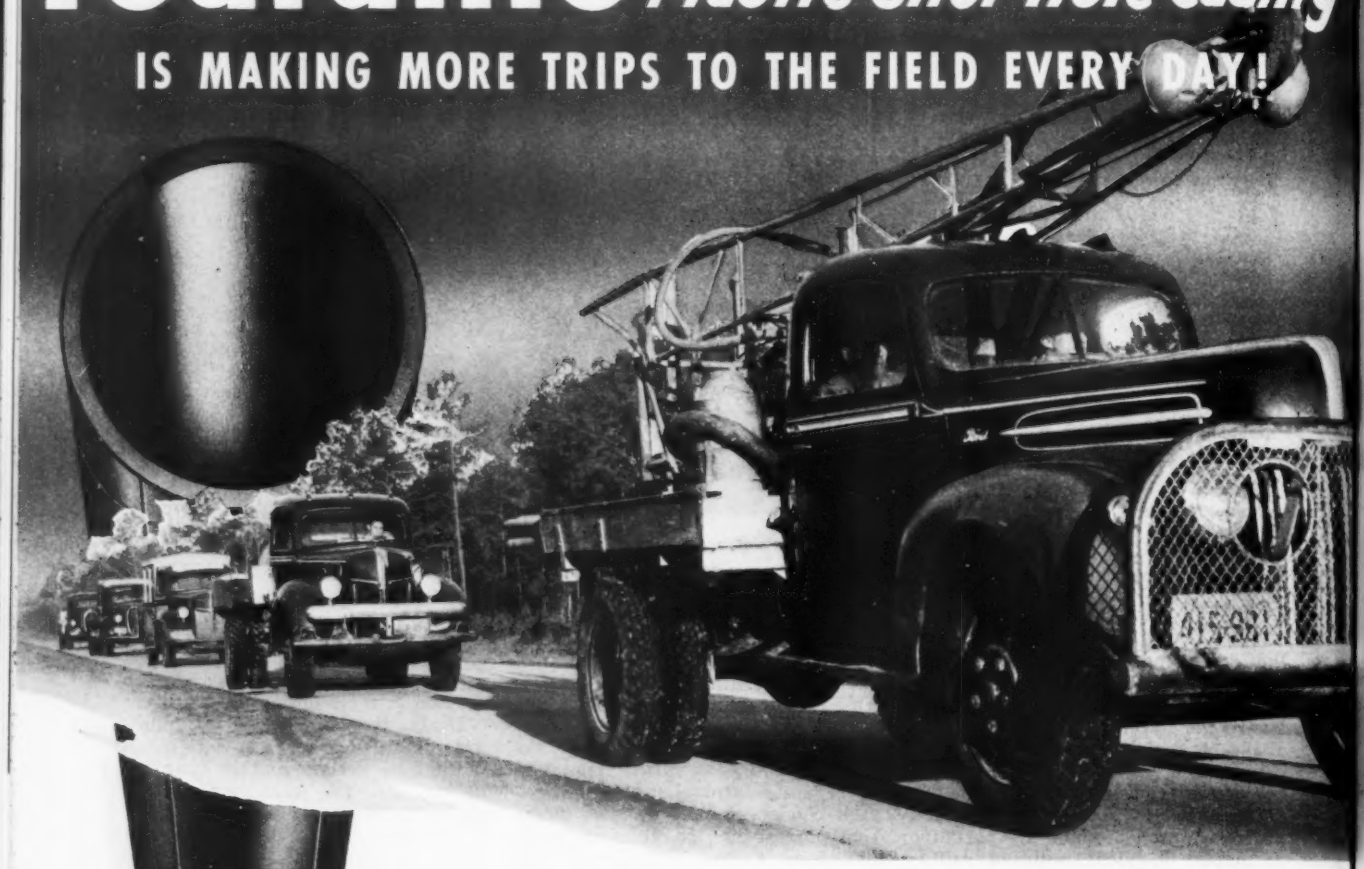


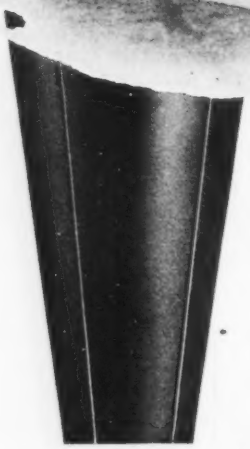
Battery of Worthington product pumps at Grapeland plant



Fedralite *Plastic Shot Hole Casing*

IS MAKING MORE TRIPS TO THE FIELD EVERY DAY!





- **Light Weight**
- **Strong-Tough**
- **Safer**
- **Factory-Threaded**
- **More Economical**

• In every phase of geophysical shot hole work, Fedralite Plastic Shot Hole Casing means big savings. It's "right" for swamp or prairie locations. And that's why it was quickly accepted by the trade . . . because Fedralite does provide a strong, light weight, trouble-saving, economical shot hole pipe in the field.

Fedralite Plastic Shot Hole Casing is easy to handle at the shot . . . convenient to transport. It provides plenty of strength for jetting and drilling operations. It is smooth-surfaced, with no burrs or sharp edges to injure hands. It is factory threaded with firm, clean, smooth threads to promote faster couplings, tighter joints. Couplings are attached at the factory.

Fedralite Plastic Shot Hole Casing has been continually improved ever since it was introduced. Federal Engineers have followed it into the field, watched it work, checked results, added refinements. That's why today Fedralite Plastic Shot Hole Casing is the best ever made . . . why it provides even faster, more economical shot hole work. That's why, too, it's making more trips to the field every day. Ask a present user about Fedralite Plastic Shot Hole Casing. You can get immediate delivery from Gulf Coast stocks.

LIGHT AS A FEATHER ...WITH STRENGTH TO SPARE....

FEDERAL ELECTRIC COMPANY, INC. OF TEXAS

PLASTIC DIVISION

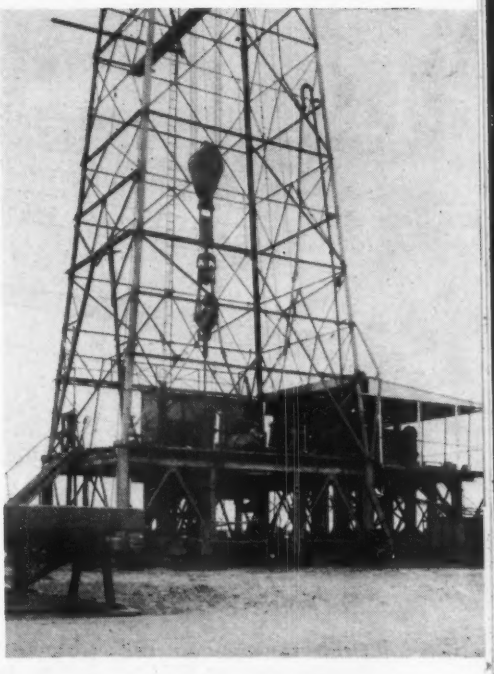
225 North Michigan Avenue — CHICAGO, ILL.

700 Waugh Drive
405 Velasco Street — HOUSTON, TEXAS
2114 Main Street — DALLAS, TEXAS
JENNINGS, LA.
1701 Grand Avenue — KANSAS CITY, MO.
730 St. Charles Street — NEW ORLEANS, LA.

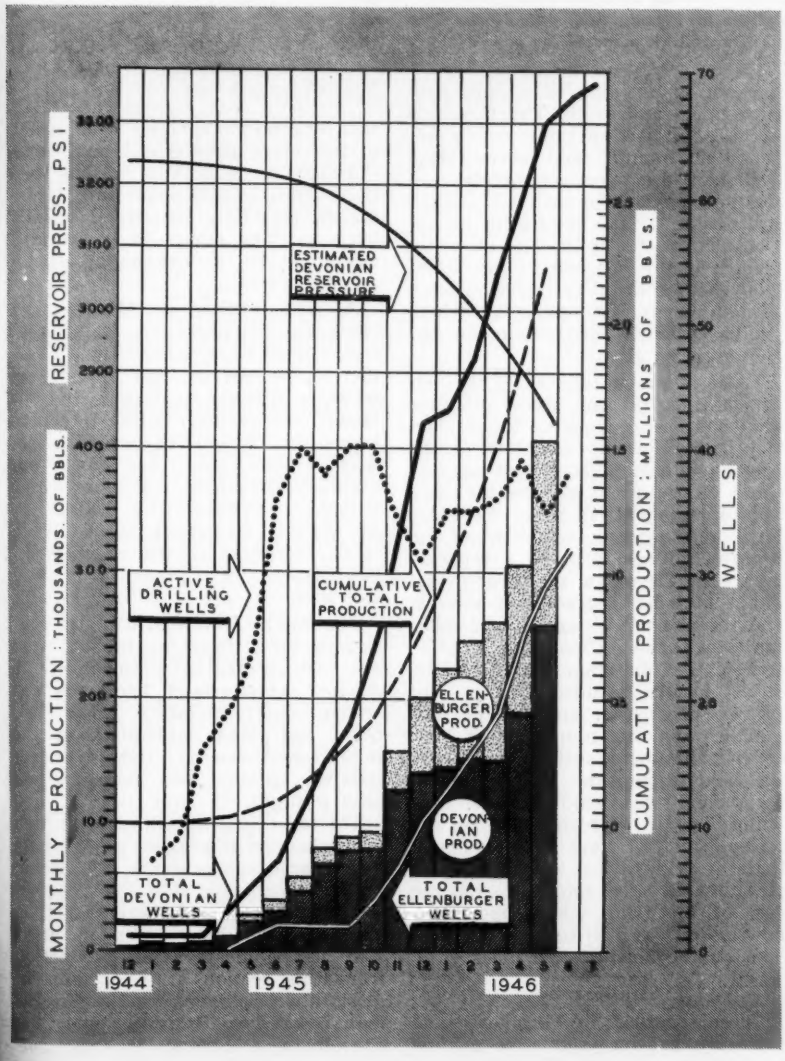
TXL Is Representative of New Pre-Permian Fields; Promises Major Reserve

by George Weber

Deep drilling in West Texas, to the Devonian and Ellenburger—what are the many drilling and production problems in the picture? Last week George Weber, of the Journal's Dallas office, high-spotted the over-all view of current deep drilling in the Permian Basin. In this article he gives the facts and specifications on one of the most prominent pools currently under development in the area.



Heavy rigs are required to complete wells in the two pre-Permian producing horizons at TXL field. Drilling time has been greatly reduced, now averaging 75 days for Devonian wells and 100 days for Ellenburger wells



IN many respects the TXL field of Ector County, West Texas, is representative of the several pre-Permian developments located in the Permian basin of West Texas and New Mexico. Currently the most active drilling area in the district, it shows promise of becoming a major oil reserve.

Discovery of oil in the upper chert member of the Devonian formation in December 1944 led to rapid exploration of the new field, spurred by further discovery of deep Ellenburger production in April of the following year. Secondary-production possibilities are indicated in varying degrees from three other pre-Permian and three Permian horizons, although all wells to date have been projected to either the Devonian or Ellenburger formations. The field still holds possibility of extension in three directions, and its further development is expected to continue for at least another year.

In early July a total of 32 Ellenburger and 69 Devonian wells had produced over 2,500,000 bbl. of oil, and 40 rigs were drilling in the field, most of them to the Ellenburger horizon. The high drilling rate is largely

Fig. 1—Combined development history-production data chart for the Devonian and Ellenburger at TXL field in Ector County, West Texas

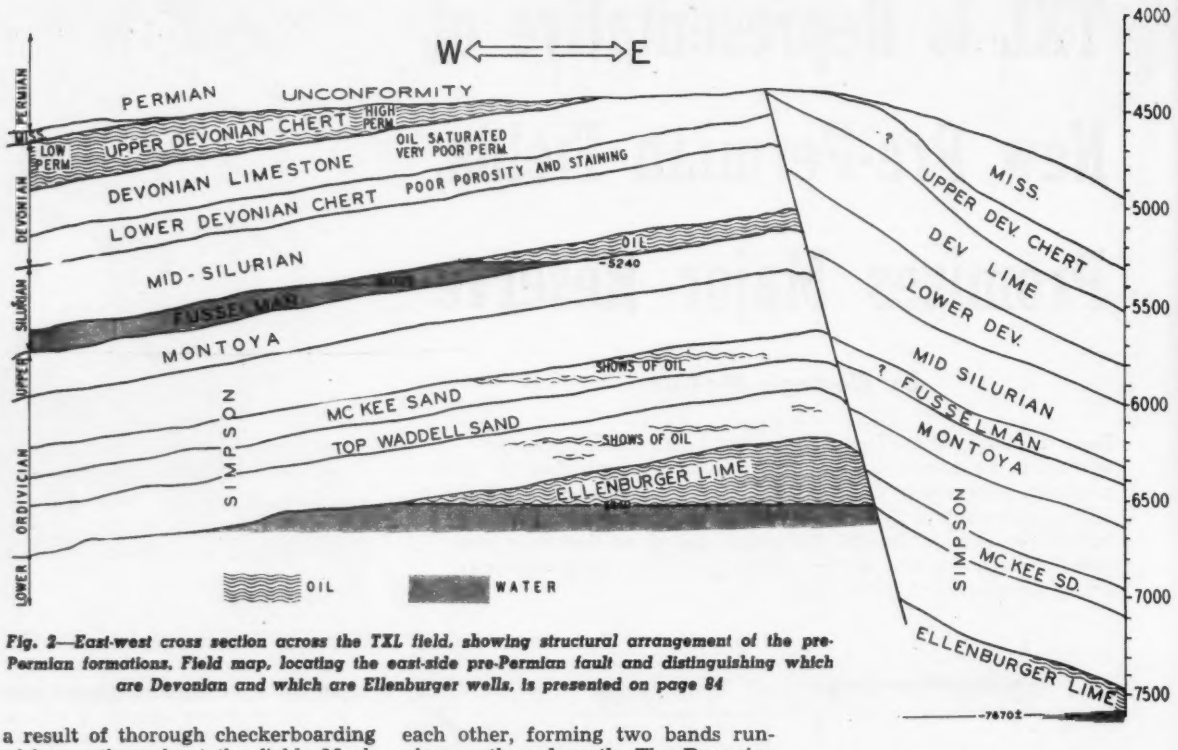


Fig. 2—East-west cross section across the TXL field, showing structural arrangement of the pre-Permian formations. Field map, locating the east-side pre-Permian fault and distinguishing which are Devonian and which are Ellenburger wells, is presented on page 84

a result of thorough checkerboarding of leases throughout the field. Much of the acreage is leased from Texas Pacific Land Trust, from whose New York Stock Exchange market code the field received its name. The development history to date is charted in Fig. 1.

Structure

The field is formed by an elongated pre-Permian anticline extending in a general north-south direction. A simple structure as compared with other pre-Permian folds, it shows to date the presence of only one major fault, which has an approximate north-south strike along the east edge of present production. Only one well had been completed in the Ellenburger formation on the downthrown or eastern side of the fault by early July, and little is currently known of subsurface conditions in the downthrown block. Fig. 2 is a generalized east-west section of the pre-Permian formations across the anticline, showing the estimated displacement and location of the major fault.

During the late Pennsylvanian erosional period, all sediments of Pennsylvanian and Mississippian age and some of Devonian, were eroded on the structure. Overlying Permian beds show relatively little dip as compared with older formations beneath the unconformity. Two pronounced pre-Permian domes exist along the crest of the structure, and minor faulting is in evidence. Widespread fracturing exists in the dense formations, increasing in intensity to the crest of the structure. In areal projection the two principal producing areas adjoin each other, forming two bands running north and south. The Devonian band is limited on the west by absence of fracture and permeability sufficient to support commercial production, and on the east it is limited by erosion of the producing formation against the uplift. The oil-water contact in the Ellenburger lime coincides with the top of that formation along a line approximating that which limits Devonian production on the east.

Little is known concerning the major fault at present, since only one well had been completed for production in the downthrown block on the east by mid-July. That well encountered oil saturated Ellenburger lime approximately 937 ft. below the water level in the same formation on the upthrown block, proving a separate reservoir. Devonian production east of the fault has not yet been proven.

A recent north extension of 2 miles indicates further Ellenburger production in that direction. On the south, a test located 4 miles from present proven production encountered Devonian production almost 700 ft. lower than the lowest such production in the field proper, and was completed for a small well making 50 per cent water. This is not regarded as an extension to TXL, but it is believed that the wildcat has located another structure. Greatest interest lies to the east of the field, where operations now under way will reveal important data on the downthrown block.

Stratigraphy

Three separate pre-Permian reservoirs are proven productive at this time and oil shows have been tested in two other pre-Permian and three Permian sections. The various sections from Mississippian into Ordovician are easily identified, usually from cuttings alone. They are discussed below in descending stratigraphic order.

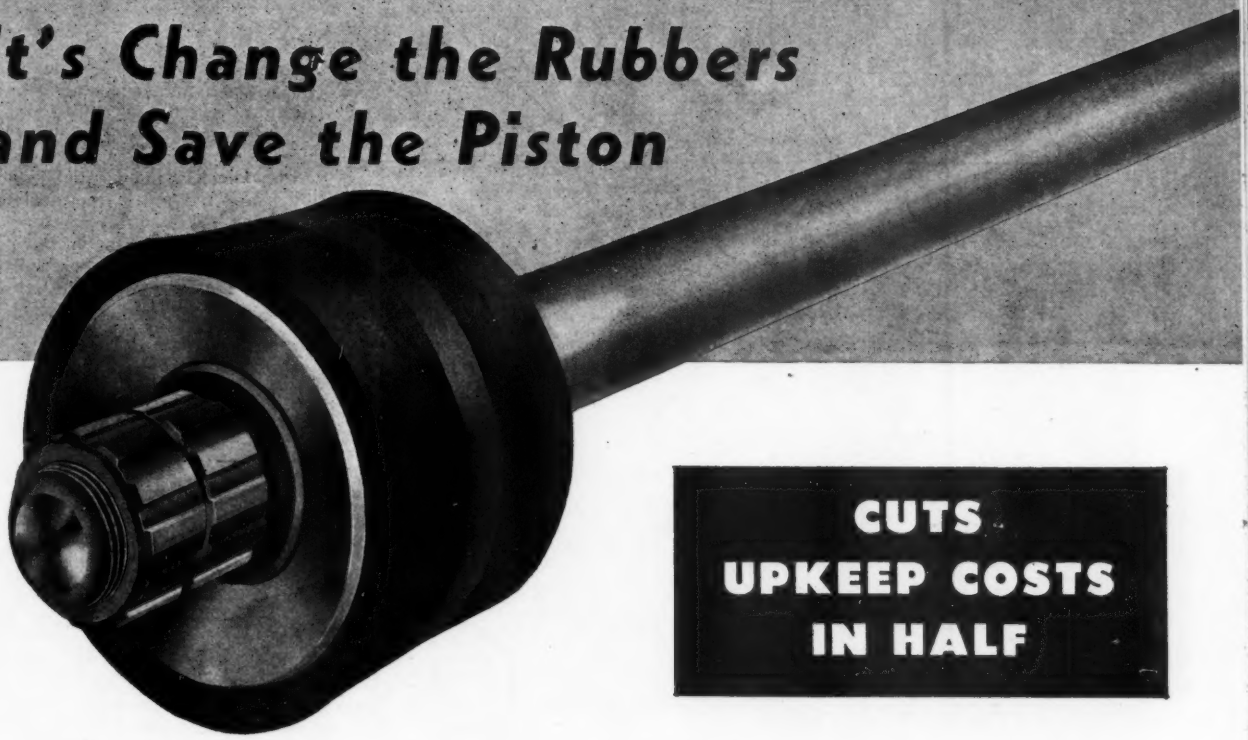
A thin section of Mississippian black shale is penetrated on the extreme west flank of the field. Farther to the east the base of the Permian is directly underlain by the upper chert member of the Devonian formation. The bulk of Devonian production comes from the dense but highly fractured chert member which varies in thickness from 200 ft. on the west to its eastern eroded limit. Gross thickness of the chert member averages 100 ft. over its productive area.

The middle Devonian member consists of white limestone, oil saturated but with insufficient permeability to produce commercially. The lower Devonian chert member shows less chert and more dolomite than the upper chert section, and is unproductive, having poor porosity and only a slight oil stain.

The top of the mid-Silurian section is marked by a grayish green shale and the oil-saturated Fusselman member comprises pale blue chert in white limestone with cavernous-type fracture. High flow rates on drill-stem tests indicate better production from this section at TXL than in most other fields where the Fusselman is present. However, since the Fusselman producing area is con-

with MISSION PISTONS

it's Change the Rubbers and Save the Piston



CUTS UPKEEP COSTS IN HALF

Unconditionally Guaranteed

. . . to be perfect in material and workmanship and to be the most economical piston on the market to operate.

The Mission principle of replaceable rubbers on a long-lasting body **saves money** formerly invested in continually buying new bodies. Mission rubbers are extremely long-lasting and trouble-free and are replaceable on the derrick floor without removing piston from rod.

Life of liners and pistons increased . . . because the Mission design of more rubber and less metal gives far greater wiping surface, eliminating by-passing.

★

It's Mission Pistons the world over, because with Mission it's "Change the rubbers and save the piston." Specify Mission.

Mission Manufacturing Co.

HOUSTON TEXAS

EXPORT OFFICE: Room 1636, 30 Rockefeller Plaza, New York 20, N. Y.

SOLD THROUGH SUPPLY STORES EVERYWHERE

MISSION SLUSH PUMP VALVES . . . MISSION FLUID END PISTONS . . . MISSION PISTON RODS

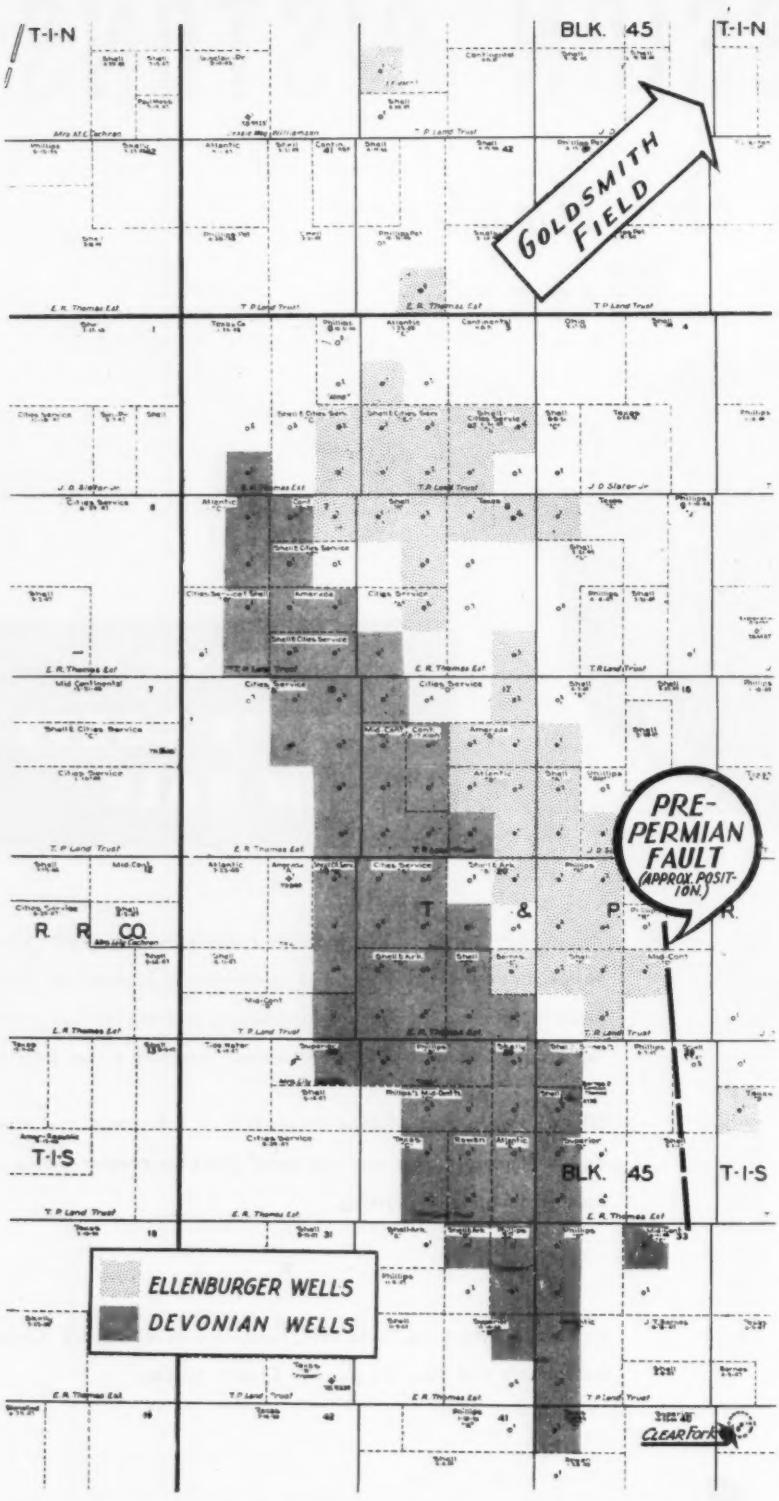


Fig. 3—Map of TXL field, which is in the 100,000,000-bbl. reserve class. By last month, there were 32 producing Ellenburger well: (average cost $175,000) and 69 Devonian wells ($150,000); 40 rigs running. Map constructed from base furnished by Western Co., Midland, Tex.

tained within the more important Ellenburger area, all wells to date have been completed in the deeper pay, and the Fusselman is considered as a secondary-development horizon to be tapped possibly after the Ellenburger is depleted.

The top of the Montoya or Upper Ordovician is easily identified as dark mottled chert. The Simpson section, underlying the Montoya, is marked by light gray or tan, finely crystalline dense lithographic lime containing sand streaks. In this Middle Ordovician formation the McKee and Waddell sand members show oil but are not at present considered seriously from a production standpoint.

The Ellenburger limestone, of Lower Ordovician age, is a coarse to medium crystalline white to light tan dolomite interspersed with varying amounts of chert. Like the Devonian chert, it shows high potential flow rates from the fractured porosity.

A number of oil shows have been encountered in the lower 1,500 ft. of Permian deposits. In this section the Wichita and Wolfcamp horizons have been tested for oil. A recent attempt to complete a Devonian failure in the latter pay, however, revealed it incapable of commercial production in the southwest section of the field, and the test was plugged back for completion in the Clear Fork pay, which produces in one other well 1 mile southeast of present pre-Permian production.

Devonian and Ellenburger production west of the fault is proven over about 3,500 acres for each formation at the present development stage. Erratic porosity and permeability characteristics which are typical of similar reservoirs in West Texas, preclude accurate estimates of reserves based on reservoir-volume data. A common yardstick of 100 bbl. per gross acre-foot is used by many engineers in fixing reserves in such fields. This figure is based on recoveries from Big Lake which has produced nearly 103,500,000 bbl. of oil from Pennsylvanian and Ellenburger formations since 1928. Employing that basis for estimating reserves places TXL in the 100,000,000-bbl. reserve class, as presently developed.

Drilling, Completion Practices

Penetration rates at TXL have been successively increased as the field develops, through use of water as a drilling fluid, added weights on bits in the form of drill collars, and improved drilling controls and instruments. Water is generally substituted for mud below the surface casing seat, and is continued to within 200 ft. of the base of the Permian formation, where it is replaced by low-water-loss mud to total depth. This has resulted in reducing mud costs from $12,000 to $1,000 in some cases.

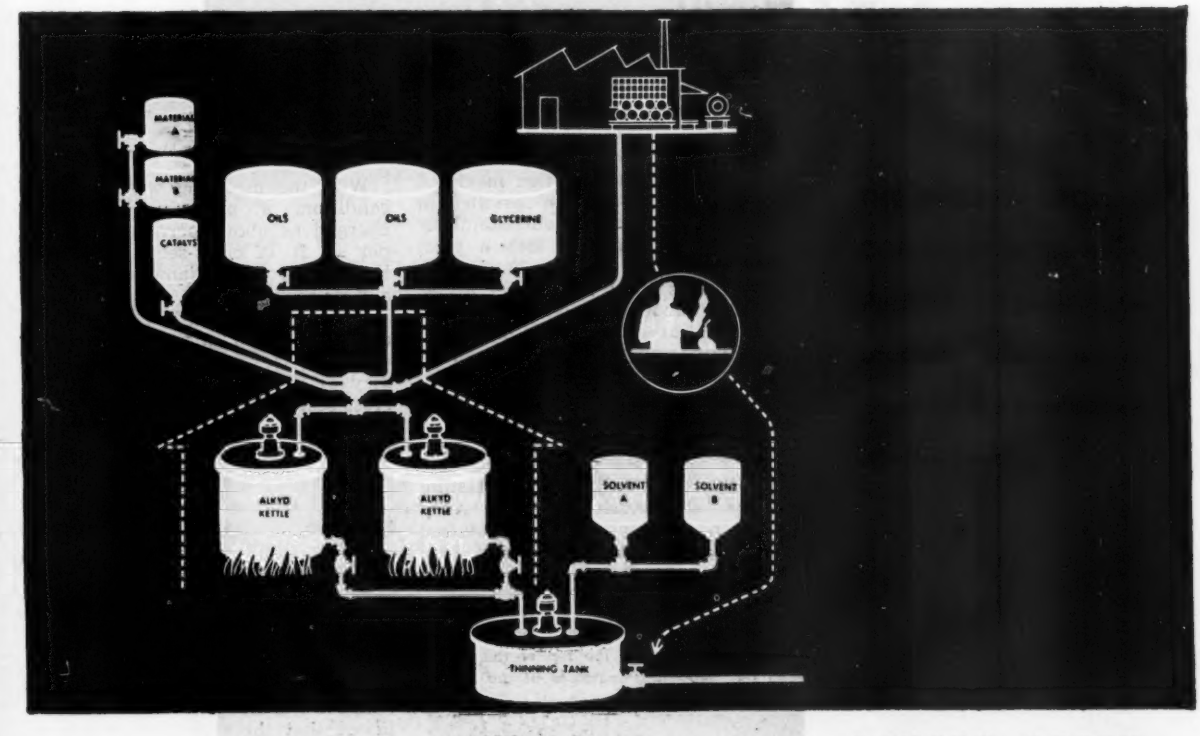
The setting of a long 8⅝ or 9⅝-in. intermediate casing string through the last of the salt stringers, usually to 4,000 ft., is now universal practice. Nearly all wells are now completed with 5½-in,. production casing. About half of the wells have casing set on top of the producing formation, while the remainder have casing set

(Continued on page 122)

Brolite SYNFLEX

THE MODERN ALKYD BASE FINISH—GIVES MORE DURABILITY THAN ANY PREVIOUSLY KNOWN ALL-PURPOSE FINISH

PROVEN IN TOUGH ARMY AND NAVY SERVICE



Synflex is different. It is far more durable. It has many times the gloss retention, water resistance, and exterior or interior durability of any previously known all-purpose finish.

The combination long oil alkyd vehicle makes Synflex the modern finish for all surfaces—wood, metal, concrete. On metal, it is the ideal finish over one or two prime coats of Syncro-Green metal primer.

The beautiful glossy finish may be continually washed without losing its luster. Its extra weather resistance makes it preferable for exterior wood and metal surfaces. Recommended for buildings, bridges, factories, etc., wherever a finish of great durability is required.

Stocked in clear, white, black and twenty-four standard colors. Write for technical data and color card.

SYNCRO-GREEN METAL PRIMER

Navy and Maritime Commission changed from red lead to zinc chromate primer because of its greater rust resistance, toughness, and adhesive film—quicker drying and lower cost.

Syncro-Green is the outstanding zinc chromate primer.

Write for proof of its superiority.

ANDREW BROWN COMPANY • • • 5401 DISTRICT BOULEVARD,

LOS ANGELES 22, CALIF. • 244 CALIFORNIA ST., SAN FRANCISCO 11, CALIF. • 1106 TWELFTH AVE., SEATTLE 22, WASH.

Engineering Factors for Pressure Filters, Pits, Injection Wells, and Other Items Used in the East Texas Field

Salt-Water Disposal

PART 3 OF A SERIES

by W. S. Morris*

ALTHOUGH open sand filters are used by some of the other companies in the East Texas field, pressure filters are in more general use. The pressure filters are usually 72 or 96 in. in diameter with dished heads and 60 in. in the shell. They are constructed of steel plate ¼ in. thick. The salt water enters the top of the filter through a spreader arrangement on the inside and after passing through the filter bed the water is taken out through an underdrain system in the bottom of the filter. An installation of two pressure sand filters is shown in Fig. 1. These filters are so connected that each may be operated separately and independently of the other. This flexibility permits one filter to be backwashed while the other is in service.

Considerable difficulty has been experienced with corrosion inside the filters, particularly in the underdrain system. When pipe spreaders and cast-iron nozzles are used they have to be replaced at frequent intervals. A brass underdrain system insulated from the shell has been installed in one filter as an experiment. Stainless-steel nozzles screwed into a steel plate through which the water underdrains is used in another filter. Recently underdrain systems made entirely of asbestos-cement pipe have been found satisfactory and to eliminate corrosion.

To protect the inside of the steel shell from corrosion, several plastic paints have been tried without success. A lead-base paint sprayed inside the filter after sand blasting proved unsuccessful after a very short time. Bituminous paint brushed on the inside of the filters had little if any value. Vinyl-resin plastic brushed over a vinyl primer in two filters retarded corrosion for a while but failed badly in less than 1 year's service. Water blisters have appeared in other filters that had been sand blasted and coated with a vinyl-type plastic. Additional plastics are under test and arrangements are being made for the testing of additional materials but so far no satisfactory coating has been found.

In general, sand and gravel are used as the filtering media. The filter bed is usually 36 in. deep and consists of hard round sand 0.4 to 0.5 mm. with a uniformity coefficient between 1.5 and 1.6.

Section in filter	Mesh in.	Depth in.	Charge for 8-ft. filter cu. ft.
Top—sand	0.5 mm.	24	100
Second—gravel	1/8 x 1/4	3	13
Third—gravel	1/4 x 1/2	3	13
Fourth—gravel	1/2 x 3/4	3	13
Bottom—rock	3/4 x 1 1/4	3	13

With the incoming water in good condition, a pressure sand filter charged as above permits 3.5 g.p.m. per sq. ft. of cross-sectional area to be used. A 96-in.-diameter filter has a cross-sectional area of approximately 50 square ft. and can be operated at a rate of 175 g.p.m. When anthracite coal is used, the filtering rate may be up to 5 g.p.m. per sq. ft. of cross-sectional area.

The anthracite coal used has a uniformity coefficient of 1.75 and the charge for a filter is as follows:

Section in filter	Size in.	Depth in.	Amount required lb.
Top	0.6 to 0.8 mm.	12	2,600
Second	3/32 x 3/16	6	1,300
Third	3/16 x 5/16	6	1,300
Fourth	5/16 x 9/16	4	900
Fifth	9/16 x 13/16	4	900
Bottom	13/16 x 1 5/8	4	900

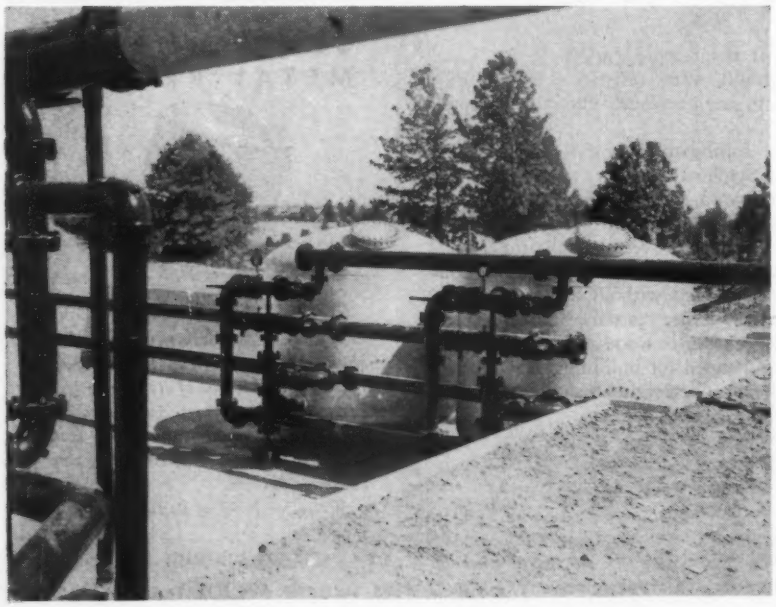
The anthracite coal beds offer less resistance to flow than sand. It is believed that the coal is less efficient than sand in filtering water with fine particles in it, but is very efficient where considerable amounts of coarse floc are present. Gravel to support the coal bed should decrease the cost slightly and allow better gradation of filter bed and gravel with less danger of mixing.

The filter beds are backwashed at regular intervals depending on the amount of impurities removed. The usual interval for backwashing is once in 24 hours although in some cases more frequent backwashing is necessary. A backwashing rate of approximately 4 to 5 times the filtering rate has proved to be most satisfactory.

A typical report on a sand charged filter shows that when 4,900 bbl. per day are passed through the filter, at the rate of 2.9 g.p.m. per sq. ft. of filtering area, intervals between backwashing are 12 hours, and 14 lb. of sludge are removed at each backwashing. The rate of backwashing is

*Vice president and general manager, East Texas Salt Water Disposal Co., Kilgore, Tex.

Fig. 1—Two pressure sand filters connected so that each may be operated independently and backwashed while the other is in service. Salt water enters the top of the filters, passes through the filter sand bed and is taken out through a manifold at the bottom



12.5 gal. per min. per sq. ft. of filtering area; 5 minutes are required for backwashing and 20 minutes for settling. Operation of filters under these conditions gives good results.

On another filter charged with anthracite coal the backwashing interval was 24 hours while 4,130 bbl. per day were passed through the filter. This is a rate of 2.4 g.p.m. per sq. ft. of filtering area. Thirty-three pounds of sludge were removed per filter per backwash. The backwashing rate was 12.7 g.p.m. per sq. ft. and required 5 minutes for each filter, with 10 minutes settling time. This operation was considered satisfactory.

Construction of Gunite Concrete Pits

Most of the treating and settling pits for salt water in the East Texas field are constructed of gunite concrete. The placing of gunite concrete has reduced the cost of impervious concrete reservoirs and has materially reduced the time required for the construction.[1] In this process, one bag of Portland cement is used to 3 cu. ft. of screened dry sand by volume. This mixture is discharged under air pressure through a nozzle where water is added and the mixture impinged against a prepared earthen base. The application of gunite at one of the Salt Water company plants is shown in Fig. 2. The reinforcing wire is 10 gage 6 by 6-in. mesh. The gunite is applied to a minimum thickness of 2¼ in. with the reinforcing mesh in close proximity to the center of the completed gunite. The sides of the pit are fine graded to a slope of 1½:1 and requires no forms in the gunite application. Some of the pits use expansion joints at intervals of 20 to 30 ft. However, the Salt Water company uses expansion joints only at the foundations for the baffles.

When an oil well was converted into a salt-water-injection well or an abandoned well used for salt-water injection, generally only those with 7-in. o.d. casing were used, so that 5-in. cement-lined casing could be used as tubing. After placing a cement or plastic plug in the lower end of the casing, the casing was tested with water pressure to 600 psi. after which the hole was filled with mud and the entire sand section drilled with rotary tools, cutting a 6¼-in. hole.

When the total depth had been drilled, an electrical log was run, after which the liner seat was determined and approval obtained from the Railroad Commission. The liner seat was invariably selected at a point below a substantial shale break below the original oil-water contact at 3,320 ft. below sea level. The 6¼-in. hole was underreamed to 8 in. with rotary tools to the approved liner seat. Heavy mud or a cement plug was placed in the hole below the liner seat to prevent migration of the cement which was circulated around the liner. When 7-in. o.d. casing had been used in the well, a 5½-in. o.d. liner, with a set shoe on the bottom, was run from the liner seat to a minimum of 50 ft. above the 7-in. casing shoe. A canvas cement packer and liner hanger were used on top of the liner. The liner was cemented for its entire length and left full of cement for a minimum of 72 hours, after which the liner was tested under 600 psi.

The cement was drilled from the liner with 4¾-in. rock bit and the hole cleaned out to the total depth. The hole below the liner to the total depth was then underreamed to 8 in. in diameter with reverse circulation, using high-pressure gas. After the tools were removed, the well was backflowed from approximately 2,100 ft. for a period of 8 hours. The 5-in. o.d. cement-lined tubing was then run into the hole with sufficient amount of 3-in. upset tubing on the lower end to extend through the liner. A thin-wall packer was run on the lower end to extend through the liner. A thin-wall packer was run on the lower end of the 3-in. tubing and set near the 5½-in. o.d. liner shoe.

After the string of tubing had been run, oftentimes a macaroni string of ¾-in. tubing was run to bottom and 500 gal. of 28 per cent hydrochloric acid was spotted at 5-ft. intervals in the sand section. The acid was left in the hole and as soon as the ¾-in. tubing string could be laid down (approximately 4 to 5 hours) the injection of water was started. The acid was used principally to combat any contamination of the hole caused by running of the tubing.

When injection wells were completed as indicated, the salt water was injected below the oil-water interface (protected by a substantial shale break) into the lower part of the Woodbine sand without adversely affecting the regular oil production from wells on the same lease or other leases.

Drilling of New Injection Wells

Some operators preferred to drill their salt-water-injection wells from the surface regardless of whether the wells were to be located within the productive limits of the field or west of the field. The procedure used by the Salt Water company, and in general by other operators in the field, for the drilling of such wells is as follows:

A 10-ft.-deep concrete-lined cellar is used so that the well connections can be below the ground. A 15-in. hole is drilled for about 100 ft. and 10¾-in. surface casing set with 50 sacks of cement and allowed to remain for 24 hours. A 9⅝-in. hole is

Fig. 2—Application of gunite at Gladney treating pit, East Texas field. This method of construction costs 27 cents per sq. ft. (excavation and reinforcing not included)

then drilled to a depth of 3,320 ft. below sea level, with directional surveys run at 500, 1,500, 2,500, and 3,320 ft. At the 3,320-ft. point, the hole is reduced to 4¾ in. and the entire sand section drilled with heavy mud. The electrical log is run and the casing seat selected at a point below a substantial shale break below the depth of 3,320 ft. the (original oil-water contact.)

After the casing seat is approved by the Railroad Commission, the hole is reamed to 9⅝ in. diameter from 3,320 ft. to the approved casing seat. Seven-inch o.d. seamless casing is run and cemented with 150 sacks of slow-set cement and allowed to set 72 hours, after which the casing is tested at 600 psi. pressure. At this point a reverse circulation rig is moved in and a 6¼-in. rock bit run into the hole on 2½-in. tubing. The cement is drilled from the casing and the hole straight reamed (6¼ in.) to the total depth, using high-pressure gas and reverse circulation.

The tubing is then pulled up to 2,100 ft. and the well backflowed for at least 4 hours. A retainer-type packer is set about 10 ft. from the lower end of the 7-in. casing. The tubing is pulled to 2,100 ft. and again the well backflowed. Five-inch o.d. seamless, cement-lined tubing is run with a safety joint approximately 50 ft. above the packer. The flow string is equipped with a differential flow valve at approximately 2,100 ft. for use in backflowing the well. After the 5-in. o.d. casing is set with a packer, the well connections are installed and the well backflowed through tubing for approximately 4 hours after which the injection of salt water can begin.

Use of reverse circulation with high-pressure gas in completing the well and the frequent backflowing will increase the possibility of a clean well bore. The straight reaming of the hole below the casing seat is more expedient than the underreaming of the hole below the 7-in. casing in earlier wells.

It has been found that the cost of drilling a salt-water injection well from the surface is approximately the same as converting an old well for the return of salt water to the lower part of the Woodbine sand. There are certain advantages in drilling a new well, among which is the fact that the new well can be located in the exact spot where it is most desirable rather than locating other facilities to accommodate the injection well. Wells located west of the oil-water contact have the advantage of being able to utilize the entire sand section for salt-water disposal without the necessity of protecting the upper oil formation.

Many of the wells of the Salt Water company, completed as described above, have taken in excess of 15,000 bbl. per day under gravity flow. The 1 Everett salt-water-injection well of the Salt Water company is outstanding in the amount of water it has taken without the use of pumps. The well was put into operation on March 10, 1943, and up to May 11, 1946, when pump pressure was first applied, the well had taken 14,666,103 bbl. of water with a vacuum at the well head. For months the well took in excess of 18,000 bbl. of water per day and at the time pump pressure was applied the well was taking in excess of 9,000 bbl. per day by gravity but pump pressure had to be applied in order to inject all of the water connected to that system.

Meters for Salt Water Service

The Salt Water company makes a charge of 1.8 cents per barrel of water for its service so the volume of water taken from each customer must be measured. The usual method is by a meter. No meters designed especially for salt-water service have been offered to the industry so meters of the type ordinarily used by municipalities and others in the measurement of fresh water, have been adapted for salt water use.

The master meters at the injection wells are of the cold water type and 3 in. or larger. These meters measure the water after it has been filtered and all foreign matter removed. Consequently the meters give very good service as compared to the field meters which are subjected to water with various amounts of foreign material in it. The master meters are of the turbine type with bronze impellers. The company has two weir meters at injection wells and very good service has been obtained from them. The advantage of the weir meter is the fact that no salt water comes in contact with the moving parts of the meter.

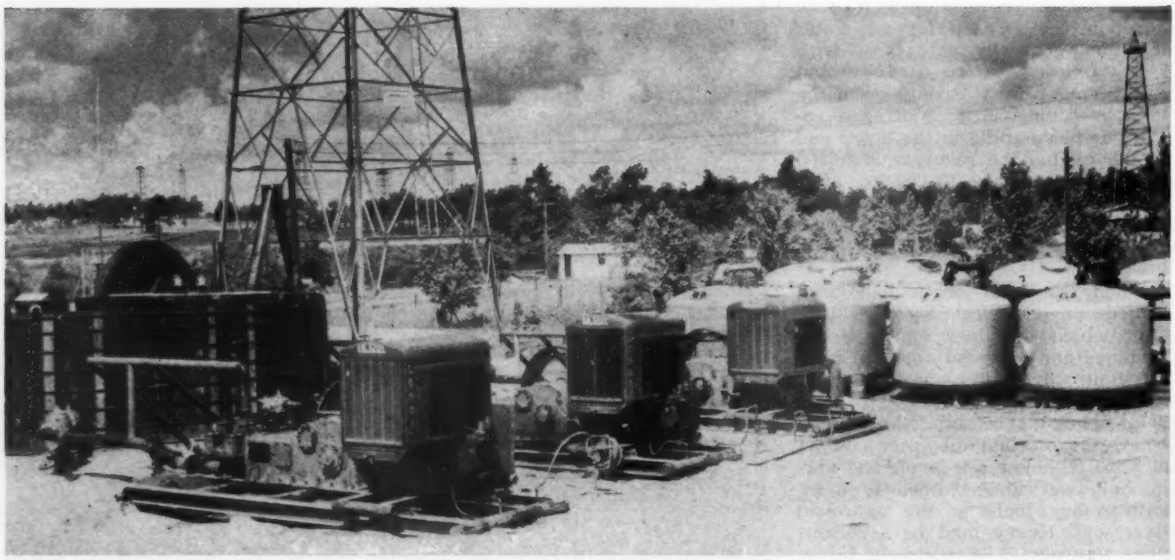
The field meters, those installed on the individual leases, are 1¼ in. or larger and are of the hot-water wobble-disk type. The company has several hundred meters in salt-water service and finds it necessary to use three meter repair crews to keep the instruments in operation.

Pumps in Salt Water Service

The Salt Water company has 36 salt-water-injection wells. Some of the wells take water with a full vacuum at the well head while others

(Continued on page 124)

Fig. 3—The three salt-water-injection pumps serving the four salt-water-injection wells in the Zeppa system take suction from the redwood clear tank (left). The eight filters (right) are 96 in. in diameter and 60 in. in the shell; each has a capacity of 5,000 bbl. per day



WORLD'S MIGHTIEST MAKER of CHEMICAL FOAM!

Fifty percent more fire-fighting foam. Think what that means! Yes, Sir! 450 gallons or more of tough, clinging, long lasting Firefoam and instantly available through scientific tank-top metering to subdue roaring-hot oil fires.

Write for safety-assuring details, contained in an 8-page brochure

Outdoor model illustrated. Also available, models for indoor and yard service, with running gear adapted for easy mobility.

OUR 2nd Century of Leadership in FIRE PROTECTION

AMERICAN-LAFRANCE-FOAMITE Corporation

ELMIRA · NEW YORK

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Oil-Firing Temperature

In your answer of July 27, 1946, you say something about how hot an oil should be for firing. How high a temperature should be used for a 110 Furol at 122° F. oil?—H.B.B.

The exact temperature to which a fuel oil should be heated cannot, of course, be stated. The firing temperature depends upon (1) the design of the burner, (2) the amount of fuel handled by the burner, and particularly (3) whether steam atomization or mechanical atomization is practiced.

The 1918 U. S. Navy Specifications for fuel oils states that the flash point should be higher than the temperature at which the oil has a viscosity of 8° Engler. This implies that the oil will be heated to such a temperature. A viscosity of 8° Engler corresponds to:

1,500 sec. Saybolt Univ.
150 sec. Saybolt Furol
58 centistokes
about 57 centipoises

Most of the burners used on ships are of the mechanical atomization type because boiler-feedwater (for production of steam) is scarce.

The Babcock and Wilcox Co. in its book entitled "Steam, Its Generation and Use" suggests temperatures of 150°-190° F. for steam atomizing burners, and 220°-240° F. for mechanical atomizing burners. They also suggest a viscosity at the firing temperature of 3°-5° Engler for mechanical burners. Stated in other units, this viscosity is:

140 sec. Saybolt Univ.
28 centistokes
about 27 centipoises

This company also suggests the following firing temperatures based on gravity but the data are so old that it is probably based on straightrun fuels rather than the cracked fuels that are so common today. Cracked fuels have a much lower viscosity than straightrun fuels of the same gravity.

11-13 A.P.I.	220°-240° F.
15-17 A.P.I.	180°-190° F.
20-24 A.P.I.	100°-140° F.
24-30 A.P.I.	80°-100° F.

John F. Straitz of the National Air-oil Burner Co. in "Heating Heavy Oil for Industrial Use," Fuel Oil, December 1928, suggests the following viscosities at the firing temperature:

Mechanical burners	2- 5 Engler
Steam atomizing—outside mix	5-10 Engler
Steam atomizing—inside mix	10-20 Engler

These correspond to the following viscosities in other units:

	Centistokes	Furol	Universal
Mechanical	12-35	-21	66-170
Steam—outside mix	35-72	21-37	170-340
Steam—inside mix	72-150	37-70	340-680

In general these values are higher viscosities (or lower firing temperatures) than most sources indicate.

F. Laverne Smith of the Hancock Oil Co. of California, in "Blending Residual Fuel Oil," Petroleum Refiner, page 95, April 1945, recommends a maximum Saybolt viscosity of 130 seconds at the firing temperature.

The only other readily available suggestion is that on page 183 of the Second Edition (1941) of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., N. Y.). The 30 centipoises given there is based entirely on the behavior of steam-atomizing burners. This viscosity corresponds to:

30-32 centipoises
160 sec. Saybolt Univ.
20 sec. Saybolt Furol

According to this meager information, the temperatures to which various fuel oils should be heated are somewhat as follows:

Viscosity Furol at 122° F.		Temperature (°F.)
*50		- 39
40	Fuel 5	80-165
45	Fuel 6 mini.	85-170
50		89-175
75		102-190
100		111-200
150		122-208
200		131-220
300	Fuel 6 max.	140-235
400		148-240

*Saybolt Univ. @ 100° F.

Thus, the residual Fuel No. 5 of the A.S.T.M. or other Commercial Standards of the Bureau of Standards need not be heated for ease of handling unless the weather or storage temperature is low but it might have to be heated to 165° F. if used in certain types of burners operating at high capacity. Some heat would always seem to be advisable for Fuel 6 and a temperature of even 240° F. under certain extreme conditions.

The literature contains no studies of the economic balance between pumping costs and the cost of steam (often exhaust steam). However, consideration of the superior burner performance of low viscosity (or high temperature) fuels and the saving in pumping costs with low viscosity fuels, points to the possibility that a high fuel temperature may always be advisable even though the burner may be able to operate on a viscous or cold fuel.

Viscosity of Brightstock Solution

In one of the Refiner's Notebooks you gave a chart for the blending of lubricating oils, but it is not big enough to get the viscosity of a solution of oil in gasoline. How do such materials blend?—F.A.R.

The viscosity of blends of lubricating oil and gasoline can be estimated from A.S.T.M. Blending Chart A (D-341-37T) which may be obtained from the society, 260 Broad Street, Philadelphia. It is presumed that the question pertains to gasoline (or naphtha) blends with cylinder stock or bright stock. If such be the case, the viscosity of the gasoline is not shown on the chart, and the A.S.T.M. suggests the use of a point 3¾ in. lower than the 33-second (viscosity) point for the gasoline. Obviously the use of such an arbitrary point is an approximation because each gasoline or naphtha will have a somewhat different viscosity.

If perchance the question pertains to crankcase dilution, the viscosity of the blends will be different from that shown in Table 1 because the diluent will be more viscous; perhaps its viscosity will be 33 seconds at 100° F. The viscosities of crankcase dilution blends have been estimated on the Questions on Technology page of February 9, 1946.

TABLE 1—APPROXIMATE VISCOSITIES OF LUBE-OIL GASOLINE BLENDS, UNIVERSAL SAYBOLT SECONDS AT 100° F.

Per cent gasoline	Viscosity of lubricating oil at 100° F. 50	100	200	500	1,000	2,000	3,000	5,000	10,000
10	44	68	107	203	333	560	770	1,100	1,370
20	40	52	68	100	140	200	255	325	475
30	37	44	51	63	75	92	106	125	160
40	35	39	42	47	52	57	61	66	74
50	33	35.5	37.5	39.5	41.5	43.5	45	46.5	49.5
60	..	33	34.5	35.5	36.5	37	38	38.5	39.5
70	..	..	..	..	33	33.5	34	..	34.5
75	..	..	..	..	..	..	..	..	33

Grapeland Plant

(Continued from page 79)

drocarbons extracted from the raw gas.

Market conditions and the yields from the field indicate that the plant should produce, now, motor fuel, kerosene, isobutane concentrate, and isopentane concentrate. Isopentane may be concentrated in the same manner that the butanes are split, by passing into the butane-splitter tower the butane-free natural-gasoline fraction, and taking off overhead an isopentane concentrate fraction. Or, the butane-free natural may be passed into the debutanizer and all pentanes removed overhead; the overhead stream may be then introduced into the butane-splitter column to take isopentane overhead and normal pentane off as bottoms, which bottoms may be mingled again with the natural gasoline or in other storage for blending as desired.

Typical of the fractions being produced in July 1942 are the following analyses of production:

It is interesting to compare these data with, for example, data on the composition of earlier fractions, made during prewar times to meet prewar requirements for the particular product mentioned. In 1941 the following analysis of a butane fraction gives an idea of the tremendous improvement in fractionation efficiency attained for wartime operations, by comparison with the 1943 proportions in the isobutane concentrate fraction:

	Per cent
C_3	25.67
i-C_4	27.38
n-C_4	46.95
Total	100.00

During the period when products as shown in Table 3 above were being made, January 1942-43, the inlet gas showed the following analyses as typical results:

Hydrocarbon—	Composition, per cent volume
Methane	85.18
Ethane	5.45
Propane	2.60
i-Butane	0.76
n-Butane	1.03
i-Pentane	0.36
n-Pentane	0.59
Hexanes and heavier	4.03

The stripped gas from the extraction process, returning to the injection well, showed the following analysis as typical, and these figures show the thoroughness of the extraction operation for especially hexanes and heavier:

Hydrocarbon—	Composition, per cent volume
Methane	92.36
Ethane	5.14
Propane	1.65
i-Butane	0.37
n-Butane	0.39
i-Pentane	0.03
n-Pentane	0.03
Hexanes and heavier	0.03

The efficiencies of the operation of such a plant as the one described here is an important factor, especially in determining the relative economy of operation under conditions of declining production. The data in Table 4 show the extraction efficiency, the process efficiency, and the over-all efficiency of the whole unit; the over-all efficiencies being the products of the extraction and process efficiencies in each case.

Typical of a period production during the heyday of the plant are the quantities shown in Table 5, covering a period of 23 days in March 1941.

The mineral seal oil is makeup absorption oil, cut from the kerosene fraction as required by the plant.

TABLE 4—EFFICIENCIES OF THE NATURAL PLANT FOR VARIOUS PRODUCTS

Hydrocarbon—	Efficiency, per cent— Extraction	Process	Over-all
i-Butane	62.4	93.93	58.61
n-Butane	83.8	96.29	80.70
i-Pentane	92.76	98.19	91.08
n-Pentane	89.96	97.15	87.40
Hexanes plus	100.00	100.00	100.00

TABLE 5—PRODUCTS MADE DURING A TYPICAL PERIOD, 1941

Product—	Quantity made, 23 days, gal.	Average quantity, gal./day
Motor fuel	2,043,908	88,500
Kerosene	115,359	5,320
C_3S	399,070	17,300
Mineral seal oil	7,396	320

REPLACEABLE SEATS

For Longer Service and Greater Value, Goode 6000 Lb. Test Unions Have Replaceable Bronze Seats.

Old Seats May Be Removed and New Ones Installed in Any Machine Shop.

In addition to replaceable seats, Goode 6000 lb. test unions give other important advantages. Double seals . . . two sealing points in each seat . . . double the service life and give double security. Three wing lugs provide faster make-up and break-out. Furnished in sizes from 2" through 4" with bronze seats; 1", 1¼", 1½", 6", 8", 10" with steel seats, for working pressures to 3000 p.s.i.

Other Goode "Double Seal" Unions are available for working pressures from 500 to 5000 p.s.i.

Sold through supply stores everywhere.

GOODE "Double Seal" WING UNION

Export Representative: HUNT EXPORT COMPANY, 19 Rector Street, New York, N. Y.; Avda. Roque Saenz Pena 832, Buenos Aires, Argentina.

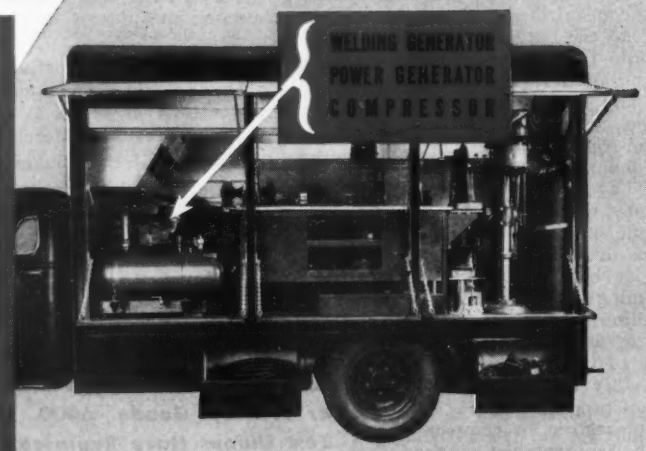
California Distributor: BETTIS RUBBER CO., LTD., 1557 So. Esperanza, Los Angeles, California.

GOODE EQUIPMENT CO., Inc.
1419 Carr Street Capitol 6338
HOUSTON, TEXAS

announcing.....

THE DAVEY MOBILE MACHINE SHOP

... now available— on standard trucks ... all of the repair and maintenance equipment ordinarily found only in large central service shops.



The Davey Compressor Co., originator of Auto-Air compressors, is pleased to announce the production of a complete, fully-equipped repair depot "on wheels"... the Davey Mobile Machine Shop.

Mounted on standard long wheel base trucks, the shop equipment is assembled around three basic power units, driven direct from the truck engine through the Davey Heavy Duty Power Take-off.

- **60 c. f. m. Davey "Auto-Air" Compressor**
- **300 Ampere Welding Generator**
- **5 KW Power Generator.**

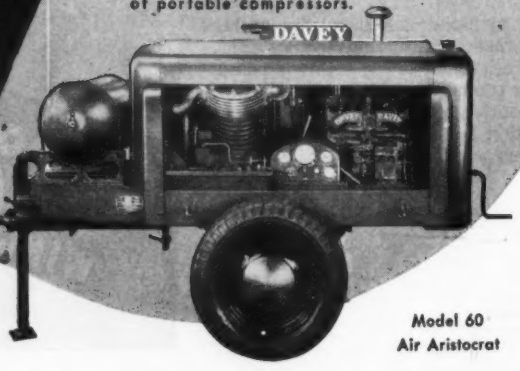
Auxiliary accessories (provided in accordance with individual user requirements) are the same as those found in stationary shops.

For complete details on how the Mobile Machine Shop will eliminate the costly practice of hauling broken-down equipment to central depots for repairs... save you time, labor and money... write today for Booklet E-208.

With body sides closed, the Mobile Machine Shop appears like any other truck . . . gives no indication of the vast amount of equipment it contains.

PAP-306

In addition to Mobile Machine Shops and Auto-Airs, Davey builds a complete line of portable compressors.



Model 60
Air Aristocrat

DAVEY

There are Davey Dealers in Principal Cities

DAVEY COMPRESSOR CO.
KENT, OHIO

A Factual Analysis of the

EFFECT OF WELL SPACING ON OIL RECOVERY

*by R. C. Craze and S. E. Buckley**

FOR many years operators and technologists have attempted to evaluate the influence of well spacing on oil recovery. Numerous investigations have been conducted, and many papers have been written on the subject. This paper presents the results of a study by the authors of field data on reservoir characteristics and oil recoveries of approximately 100 oil reservoirs scattered throughout the United States. These data were accumulated by and made available to the authors by the special study committee on well spacing and allocation of production of the American Petroleum Institute. It is felt that it will be of value for the industry to have before it at this time, in its planning of future operations, a comprehensive study of the observed effects of well spacing on ultimate recovery, based not on speculation, theory, or laboratory data, but on the actual performance of producing oil fields.

Data on 103 oil pools have been made available to the authors for critical analysis to determine from actual field data what relationship might exist between ultimate oil recovery and well spacing. The authors state that in the course of this analysis it has been found that the recovery from these fields is dependent on oil viscosity, reservoir-pressure decline, and formation permeability, and that on the other hand, no evidence was found that their recovery is influenced by their well spacing. This paper was delivered orally at the 25th annual meeting of the American Petroleum Institute. Its printed form, just released, has been eagerly awaited by the industry.

Compilation of Data

Available to the authors for analysis were comprehensive data on 103 oil reservoirs. These data are presented in Tables 1 and 2. These fields were chosen for study because of the completeness of the available reservoir data and past performance records, and because of reasonable assurance that the indicated recoveries will be produced. From the standpoint of depletion, 62 of the 103 fields have produced to date more than 50 per cent of their expected ultimate production, and 12 additional fields are more than 40 per cent depleted. Included are fields in California, Colorado, Illinois, Kansas, Louisiana, Mississippi, New Mexico, Oklahoma, Texas, and Wyoming.

*Humble Oil & Refining Co., Houston.

Analysis of Data

A cursory examination of the data reveals that the anticipated recoveries vary from 126 to 1,165 bbl. of stock tank oil per acre-foot. The average well spacing ranges from 2.6 to 65.6 acres per well. These recovery differences reflect the effects of the many factors which fix ultimate recovery.

Further analysis of the reported recoveries indicates that, in general, those fields which are producing primarily under the influence of water drive are expected to yield the greater recoveries whereas the remaining fields, which produce under dissolved-gas or gas-cap drive, will have generally lower yields. Such a result is to be anticipated. It is necessary, then, as the first step in a recovery well-spacing analysis, to segregate the fields into two main groups, viz., water-drive and gas-drive, according to the chief motivating forces in the production of the oil. This separation places in the water-drive classification 76 fields, 70 of which produce from sand formations, and 6 from lime or dolomite. In the gas-drive classification there are 27 fields.

Recovery Well-Spacing Relations

Gas-drive sand fields.—The 27 oil fields producing from sand formations under dissolved-gas or gas-cap drive are widely distributed geographically. They produce from formations differing in geologic age and characteristics, and operate with different efficiencies. Their porosities range from 12.5 to 29 per cent, and average 20.5 per cent. Their permeabilities range from 7 to 2,000 md. The interstitial or connate water varies from 2 to 40 per cent of the total pore volume, and averages 28 per cent for the 27 fields. The average reservoir temperature is 124° F. Oil gravities cover a wide range, varying between 22.5° and 46.4° A.P.I. The viscosities of the individual oils, at reservoir conditions of pressure and temperature, range from 0.45 to 9.5 cp. Reservoir volume factors of the saturated oils, a measure of the shrinkage of the oil upon liberation of its dissolved gas, vary from 1.03 to 1.67. The average well spacing ranges from 2.8 to 46.8 acres per well.

TABLE 1—RESERVOIR AND PRODUCTION DATA

Study No.	Type of formation	Type of drive	Area of reservoir (acres)	Thickness of oil-producing formation (ft.)	Porosity (per cent)	Interstitial (connate) water (per cent)	Permeability (md.)	Depth of reservoir (ft.)	Reservoir temperature (°F.)	Initial reservoir pressure (psig.)	Current reservoir pressure (psig.)
1	Sand	Dissolved-gas	13,000	59	20	15	90	2,000	93	750	15
2	Sand	Water	1,000	10	30	35	1,000	6,600	158	2,950	2,880
3	Sand	Water	960	41	18	20	75	3,200	136	1,440	....
4	Lime	Water	4,400	20	Cavernous	..	....	3,540	90	....	....
5	Sand and lime	Gas	10,000	16.5	12.5	20	150	3,800	118	1,300	182
6	Sand	Water	135,076	35	25.22	17	2,000-3,000	3,700	146	1,620	1,015
7	Lime	Water gas-cap	20,000	100	Cavernous	20	Cavernous	1,000-1,800	82	700	521
8	Dolomite	Water	6,200	30	.	..	....	3,500	....	1,375	713
9	Lime	Water gas-cap	10,040	124	Cavernous	20	Cavernous	4,050-4,174	96	1,500	1,165
10	Sand	Water	4,250	17	32	30	50-5,000	3,500	134	1,980	1,925
11	Sand	Water	550	11.6	27.6	30	2,800	2,200	122	864	774
12	Sand	Dissolved-gas	280	43.5	15.3	40	6.8	2,100	109	....	25
13	Sand	Dissolved-gas water	1,868	20	28	30	264	4,850	165	1,900	1,245
14	Sand	Water	472	36	22	15	0-1,650	4,800	132	2,048	1,680
15	Sand	Dissolved-gas	24,913	43.3	17	35	125	2,900	120	1,165	45

(Continued on page 100)

ANDERSON - PRICHARD OIL CORPORATION of Oklahoma City has successfully completed the second triple zone well in Oklahoma. A McEvoy Christmas tree was used on this well.

e completion well
oy Christmas tree

THERE ARE MANY REASONS why such a large share of difficult wells are completed with McEvoy Christmas Trees.

The wide variety of interchangeable parts makes it possible for McEvoy to offer a tree *exactly* suited to your well and your method of completion. This means an economical, trouble-free well head.

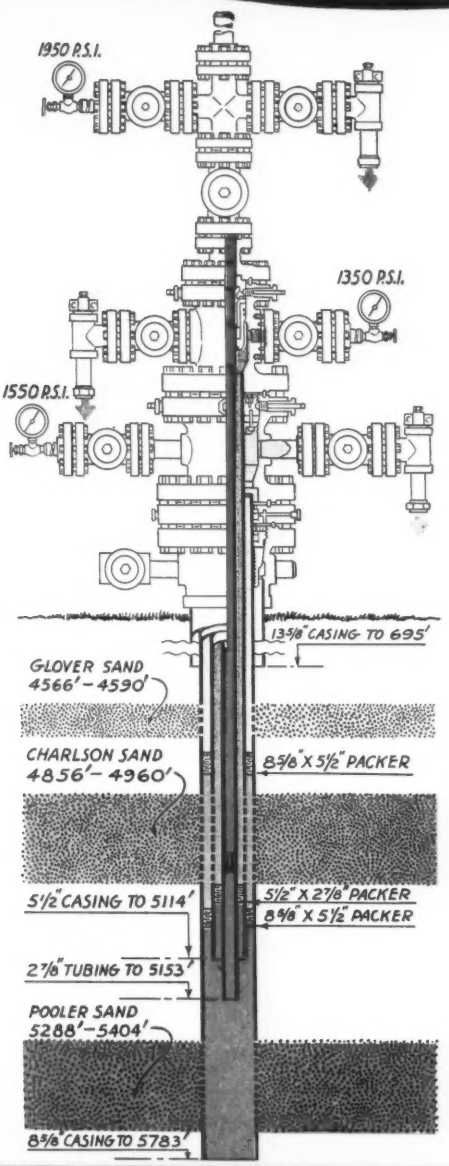
The extra quality of materials and machining prevents installation difficulties and troublesome leaks.

McEvoy Well Head designs permit complete control at all times during drilling and completing operations.

If you are not already a satisfied McEvoy customer, call us in to talk over your next completion. Find out for yourself why McEvoy Trees are so popular.

1. ***Left:*** The neat, compact design and fine appearance of this triple completion tree are external evidences of flawless performance—a characteristic of all McEvoy well head equipment.
2. ***Right, above:*** This cross sectional drawing shows the types of suspension and packoff used for the various strings. The special Type AG Casing Packoff of the 5½" string successfully held the reverse pressure differential between the two casing strings.
3. ***Right, below:*** Schematic drawing of the Anderson-Prichard McCaughtry No. 1 in Grady County, Oklahoma, shows the packer arrangement used in sealing off between zones.

Sold Through Supply Stores
EVERYWHERE



McEvoy COMPANY

TEXAS AT MILBY P. O. BOX 3127 HOUSTON 1, TEXAS

EXPORT SALES: E. F. Gahan, Room 1223, 500 Fifth Avenue, New York, N. Y.

TABLE 1—RESERVOIR AND PRODUCTION DATA (Continued)

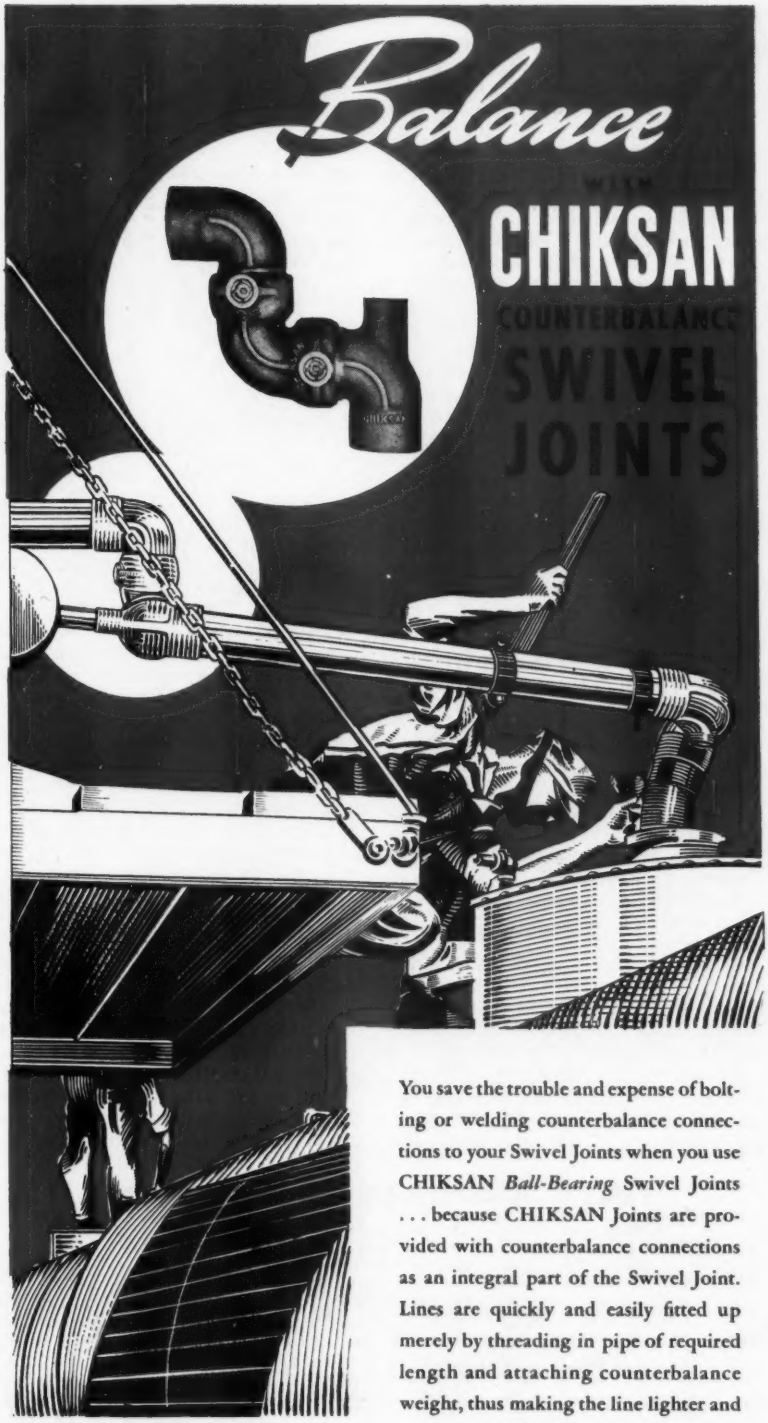
Study No.	Type of formation	Type of drive	Area of reservoir (acres)	Thickness of oil-producing formation (ft.)	Porosity (per cent)	Interstitial (connate) water (per cent)	Permeability (md.)	Depth of reservoir (ft.)	Reservoir temperature (°F.)	Initial reservoir pressure (psig.)	Current reservoir pressure (psig.)
16	Sand	Water	501	17	34	33	3,000	5,800	165	2,662	2,448
17	Sand	Dissolved-gas	7,598	120	23	2	1,500-2,000	6,500	132	2,630	26
18	Sand	Dissolved-gas	4,000	35.8	20.2	35	395	7,550	198	3,520	1,630
19	Sand	Gas	2,350	36	18	32	80	2,110	86	800	75
20	Sand	Water	1,813	18.3	14	25	118	1,950	87	735	285
21	Sand	Gas	7,550	55	20	20	400	1,100	*75	....	Vacuum
22	Sand	Gas	404	28.8	18.2	25	356	2,525	90	....	....
23	Lime	Water	4,500	90	17.6	30	1,010	7,600	207	3,480	2,876
24	Sand	Gas	915	42	13	20	206	7,200	139	2,900	1,280
25	Sand	Gas	1,280	48.3	15	20	....	3,000	133	....	....
26	Sand	Water	828	14.6	15	15	328	4,575	130	1,100	750
27	Sand	Water	423	17.1	18.9	20	450	1,700	76	750	250
28	Sand	Gas	608	13.6	17.9	35	100	2,175	85	925	500
29	Sand	Water	2,614	27.9	18.5	39	40	6,600	172	2,180	1,956
30	Sand	Water	1,153	33.9	20.7	36	72	6,750	173	2,220	2,215
31	Sand	Water	712	162	13.4	14.7	365	3,500	100	1,728	1,442
32	Sand	Water	1,350	19.8	17	31.4	90	3,000	100	1,135	200
33	Sand	Water	680	4.88	24	35	....	5,320	155	2,300	*2,000
34	Sand	Water	1,081	10.84	33	30	....	4,750	140	2,100	1,800
35	Sand	Water gas-cap	3,660	13	25	30	....	5,300	150	2,410	2,200
36	Sand	Dissolved-gas	8,833	57.45	16.2	26.5	25-228	1,850	82	700	20
37	Sand	Water	176	113	28	10	5,000	3,300	140	....	....
38	Sand	Water	105	131.7	28	10	5,000	3,500	140	....	....
39	Sand	Water	17,879	48.21	27	28	....	5,200	170	2,275	*2,014
40	Sand	Water	4,145	21	27	20	....	2,300	125	*1,250	*250
41	Sand	Water	8,154	24.4	25	20	....	2,300	128	*1,300	*125
42	Sand	Gas	946	19.4	27	35	....	3,900	147	1,680	*300
43	Sand	Water	1,640	66	26.9	25.9	1,335	9,990	210	4,615	4,450
44	Sand	Water	572	16.8	17.9	40	104	1,210	78	440	170
45	Sand	Water	1,913	10.8	17	36.7	152	2,500	97	725	....
46	Sand	Gas	1,553	12.7	18	38	100	3,086	100	885	....
47	Sand and lime	Gas	640	18	18	40	90	3,300	99	1,225	....
48	Sand and lime	Gas	3,065	18.9	17.2	35.5	75	3,200	98	1,085	....
49	Sand	Gas	1,280	14	23	25	....	2,100	110	*960	*250
50	Sand	Gas	7,330	17.47	29	20		2,700	125	1,050	*100
51	Sand	Water	1,166	16.4	31	25	1,000-5,000	6,765	164	3,150	3,045
52	Sand	Water	5,475	65.5	27.3	35	1,100	7,045	178	3,265	3,060
53	Sand	Water	340	44.2	27.3	35	1,100	7,045	178	3,265	3,112
54	Sand	Water	515	27.5	27.3	35	1,100	7,045	178	3,265	3,114
55	Sand	Water	1,145	12.3	24	42.5	300	7,045	178	3,265	2,833
56	Lime	Water	1,005	20	16	26	Cavernous	3,230	129	1,470	1,270
57	Sand	Dissolved-gas	4,345	6.9	28	25	600	2,875	145	1,125	768
58	Sand	Water	14,570	70.3	27	35	700	4,980	170	2,250	1,988
59	Sand	Water	3,410	11.9	25	35	400	4,980	170	2,250	1,145
60	Sand	Water	133,400	39.6	26	17	2,000-3,000	3,700	146	1,620	1,006
61	Sand	Water	1,616	28	26.3	35	200	6,630	185	3,060	2,639
62	Sand	Water	758	10.5	26.3	35	200	6,630	185	3,060	2,498
63	Sand	Water	1,865	17.6	28	40	700	8,730	207	4,225	2,482
64	Sand	Water	5,190	20.1	24	35	400	4,370	143	1,980	1,851
65	Sand	Water	225	18	30	30	3,000	5,870	177	2,725	2,586
66	Sand	Water	4,325	12.7	23.3	30	400	5,470	164	2,528	2,117
67	Sand	Dissolved-gas	3,850	15.6	25.5	30	300	5,320	180	2,400	425
68	Sand	Water	250	8.4	20	30	100	3,020	121	1,400	....
69	Sand	Dissolved-gas	70	17.5	21.8	25	400-500	1,100	90	400	0
70	Sand	Dissolved-gas	1,400	14.6	22	30	500	2,010	125	820	....
71	Sand	Water	1,326	45.2	26.4	35	200	3,980	156	1,800	1.567
72	Sand	Water	201	14.6	25	35	200	3,980	156	1,800	800
73	Sand	Water-dissolved-gas	4,120	13.8	30.7	25	500	2,450	132	1,000	500
74	Sand	Water-gas	1,175	85.6	31.8	30	500	3,470	156	1,550	1,302
75	Sand	Water	560	25.1	25	30	1,300	3,965	133	1,804	1,723
76	Sand	Water	325	9	25	40	600	4,360	140	1,985	1,892
77	Sand	Water	476	16.8	25	40	600	4,920	158	2,253	2,069
78	Sand	Water	7,800	47.3	24.8	25	1,000	4,230	147	1,920	1,132
79	Sand	Water	4,000	80.7	25	35	1,300	5,220	162	2,430	2,292
80	Sand	Water	505	14	24	40	1,000	3,120	146	1,450	1,226
81	Sand	Water	1,200	29.8	25	35	1,300	5,390	163	2,490	2,377
82	Sand	Water	340	50	24	40	1,000	4,350	151	2,000	1,932
83	Sand	Water	11,471	14.4	28.5	32	1,000	5,860	177	2,725	2,448
84	Sand	Water	6,246	56.5	31.5	30	3,400	5,860	177	2,725	2,574
85	Sand	Water	4,500	114	25	20	2,000	2,880	136	1,250	892
86	Sand	Dissolved-gas	303	16.6	23	35	500	1,200	96	330	25
87	Sand	Water	4,262	162.2	30.5	35	1,000	5,950	164	2,705	2,560
88	Sand	Water	335	10.7	32.7	20	1,865	9,500	182	4,400	4,260
89	Sand	Water	410	19	32.7	20	1,865	9,500	182	4,400	4,230
90	Sand	Water	340	23	33	10	2,200	6,590	183	3,040	2,540
91	Sand	Water	673	37.5	33	15	2,200	6,900	183	3,200	2,850
92	Sand	Water	125	37.5	27.7	24	420	5,500	175	2,500	750
93	Sand	Water	300	42	26	25.5	300	6,000	185	2,800	500
94	Sand	Dissolved-gas	286	91	23.5	29.2	130	6,700	196	3,080	700
95	Sand	Dissolved-gas	750	63.7	22.2	31	85	7,400	205	3,300	250
96	Sand	Water	730	115	32	21	945	3,600	136	1,600	150
97	Sand	Water-dissolved-gas	1,765	219	32.3	21.5	720	4,500	150	1,700	20
98	Sand	Water	363	230	31.3	22	640	5,000	160	2,160	200
99	Sand	Water	630	164	30.7	22.5	435	5,900	177	2,530	700
100	Sand	Water-dissolved-gas	839	332	29	23	330	6,500	188	2,830	100
101	Sand	Water	1,900	86	35	20	3,000	2,000	115	450	200
102	Sand	Water	78	242	26.5	24	200	4,700	165	1,900	300
103	Sand	Water	74	61	25.8	24	205	7,300	205	2,710	1,300

*Estimated.

The ultimate recoveries of oil from these fields are expected to be 126 to 590 bbl of stock tank oil per acre-foot.

In order to determine specifically whether or not well spacing has an effect on the ultimate oil recoveries from these fields, it would be desirable to have all factors except well spacing held constant. Obviously, such a condition does not exist for these fields; a number of factors vary simultaneously, and each exerts its own specific or corollary influence on the ultimate recovery. A second approach to the problem would be to choose a particular measure of recovery efficiency which would not be influenced by factors other than well spacing. Although this approach is also impossible, it is possible to progress in such a direction by choosing as a measure of recovery efficiency a standard or an index least affected by purely irrelevant factors. To illustrate the need for such an approach, one may consider the oil recovery expressed in barrels per acre-foot of sand. Obviously, the recovery will rise and fall with variations of porosity, even though all other factors, including the actual recovery efficiency, may be equal. Fluctuations of the observed recovery resulting from porosity differences of different fields might well prevent any detection of trends in the data with well spacing or with other factors which might specifically affect recovery efficiency. Although the disturbing effects of porosity variations may be readily eliminated through the simple expedient of expressing oil recoveries as percentage recoveries of the original oil contents of the different reservoirs, percentage recovery is also an unsatisfactory index to efficiency, being numerically influenced by the connate water content of the reservoir. For example, if two reservoirs with identical porosity, well spacing, and recovery efficiency were each to produce 300 bbl. of reservoir oil per 1,000 bbl. of total pore space, but field "A" contained 10 per cent connate water while field "B" contained 40 per cent connate water, the percentage oil recovery from field "A" would be 300 divided by 900 or 33⅓ per cent, whereas the recovery from field "B" would be 300 divided by 600, or 50 per cent.

The authors have not been able to choose for gas-drive fields any particular index to recovery efficiency which is completely free from objectionable features. Accordingly, the data have been studied with several indexes, including the amount of reservoir oil produced per unit of pore space, the residual oil saturation expressed as percentage of the pore space, and the final gas saturation expressed as percentage of the pore space. In so far as the effects of well spacing on ultimate recovery are con-



REPRESENTATIVES IN PRINCIPAL CITIES

EXPORT REPRESENTATIVE:
Chiksan Export Co., Brea, Calif.
Branches: NEW YORK 7, HOUSTON 2

You save the trouble and expense of bolting or welding counterbalance connections to your Swivel Joints when you use CHIKSAN *Ball-Bearing* Swivel Joints . . . because CHIKSAN Joints are provided with counterbalance connections as an integral part of the Swivel Joint. Lines are quickly and easily fitted up merely by threading in pipe of required length and attaching counterbalance weight, thus making the line lighter and easier to handle. Many other applications are in use. Write for latest Chiksan Catalog. Over 500 different Types, Styles and Sizes for every purpose.

CHIKSAN
TRADE MARK REG
BALL BEARING SWIVEL JOINTS FOR ALL PURPOSES
CHIKSAN COMPANY
BREA, CALIFORNIA
New York 7 Houston 2

cerned, each index indicated the same conclusions. Accordingly, to eliminate what would, in effect, amount to duplication, the results are presented in this paper with the final gas saturation as the only index. This particular index seemed from the data to be as free of objectionable features as any other, and consideration of the mechanism of oil production through gas displacement indicates some theoretical significance of final gas saturation as an index of recovery efficiency.

For the benefit of those readers who may not be accustomed to the use of final gas saturation, the following explanation is offered: In an oil reservoir the void or pore space is initially filled with oil and connate water. The connate water is usually not produced, and its shrinkage is negligible. When oil is produced, reservoir pressure declines, and space is vacated in two ways: (1) by the oil produced and (2) by shrinkage of the oil remaining in the reservoir as its gas is released from solution. All of the space thus voided is filled with gas liberated from the oil. As depletion proceeds, the gas saturation in the voids continuously increases, until the reservoir is exhausted or abandoned. Thus, the gas saturation is a measure of the depletion. In this paper the final gas saturation is taken to be the percentage of the total pore space filled with gas when a reservoir has produced its indicated ultimate recovery.

The final gas saturations calculated for the 27 gas-drive fields from the indicated ultimate oil recoveries, taking into account the connate water and the shrinkage of the oil remaining in the reservoir, were found to vary from 13.8 to 57.2 per cent of the total pore volumes.

To determine whether or not a relation exists between ultimate oil recovery and well spacing for these gas-drive sand fields, the final gas saturation has been plotted against the average well spacing for each field in this group in Fig. 1. The viscosities of the oils are indicated by symbols identified in the legend. Inspection of Fig. 1 indicates that, although there are considerable variations in gas saturation at any well spacing within range covered, 85 per cent of the points lie in a band between 20 and 40 per cent gas saturation. A statistical average of all the data indicates a constant final gas saturation of 30.9 per cent, with no discernible trend with the well spacing. This lack of dependence of the final gas saturation on well spacing over the range of 2.8 to 46.8 acres per well indicates that for the gas-drive sand reservoirs studied there is no apparent relation between ultimate oil recovery and well spacing.

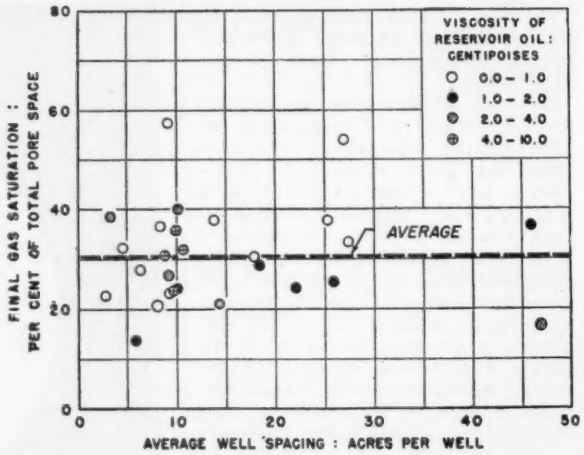


Fig. 1—Relation between final gas saturation and well spacing — gas-drive sand fields

The scattering of the points plotted in Fig. 1 undoubtedly reflects errors in the basic data as well as the effects of various factors which might affect the recovery efficiency to a different extent in the different fields. Nevertheless, it is significant to note that the variations from the average final gas saturation are random, an equal number of points falling above and below the average. If the fields are divided into two groups, i.e., those having well spacings denser than one well to 10 acres and those having more than 10 acres per well, the distribution of the points in each group is again random, with the average final gas saturation in the more densely spaced group slightly lower—indicating lower oil recovery—than in the more widely spaced group of fields. The random distribution of the points in Fig. 1 suggests the possibility that the various errors and unknown factors influencing the results may cause positive and negative deviations from the average with equal frequency, both in the closely spaced fields and the widely spaced fields. In such an event more significance might be attached to the average trend shown in Fig. 1 than would seem possible from the limited accuracy of the data. Although it is doubtful that the number of gas-drive fields studied is sufficient to meet the statistical necessities of a normal error distribution, nevertheless, the results in Fig. 1 clearly show that there is nothing in these field data to support any contention that the ultimate oil recovery is directly dependent on the well spacing; on the contrary, the results are rather indicative that the ultimate oil recoveries from these fields may be independent of their well densities.

Water-drive sand fields.—Recovery data for the 70 oil fields which produce under water drive have also been analyzed in an attempt to determine quantitatively the extent to which well spacing might affect the ultimate oil recovery. Like the gas-drive fields, these fields are widely distributed geographically, produce from formations which differ in their geologic age, physical properties, and structural characteristics, contain oils of different properties, and produce under various degrees of operating efficiency. Their porosities range from 13 to 35 per cent, averaging 26.2 per cent. Average permeabilities

TABLE 2—RESERVOIR AND PRODUCTION DATA

Study No.	Residual oil gravity (°A.P.I. at 60° F.)	Dissolved gas liberated at field trap pressure (cu. ft. per bbl.)	Saturation pressure at reservoir temp. (psig.)	Oil vol. factor (initial reservoir bbl. per stock tank bbl.)	Reservoir oil viscosity at init. conditions (cp.)	Depletion of ultimate prod. to date (per cent)	Average well spacing (acres per well)	Uniformity of spacing	Est. ultimate recovery (bbl. per ac.-ft.)
1	38	450	500	1.25	*3.19	79	10.2	Uniform	368
2	31	450	2,789	1.195	*1.27	31	26.3	Uniform	600
3	31	136	960	1.07	*1.51	53	37.0	Irregular	410
4	30	....	....	*1.15	*2.70	79	40.0	Uniform	200
5	41	404	1,300	1.24	*0.66	42.3	25.3	Nonuniform	232
6	38-39.8	365	740	1.20	1.0	42.2	4.9	Irregular	1,058
7	35	165	720	1.09	*1.46	68.8	36.1	Irregular	200
8	35	....	....	*1.19	*1.36	48.5	35.5	Nonuniform	267
9	34.5	670	1,500	1.24	1.20	52	38.0	Uniform	161
10	23	250	1,181	1.20	3.60	69	17.2	Uniform	629
11†	34.8	140	....	1.092	*1.09	35.8	34.35	Nonuniform	735
12	41	....	....	*1.28	*1.60	98	10	Uniform	138
13	40	140	778	1.318	1.30	25	46	Uniform	472
14	40	640	2,048	1.33	*0.66	48	11.2	Uniform	765
15‡	40	....	....	1.139	*0.70	97	8.0	Uniform	187
16§	35	574	2,570	1.29	*0.61	44.3	15.7	Uniform	958
17	38	735	2,630	1.356	*0.82	63.5	9.2	Irregular	590
18¶	32-34	762	3,520	1.45	*0.88	49	27.4	Uniform	237
19	42	83	....	1.100	*3.24	67	9.3	Uniform	297

(Continued on page 106)

Schlumberger Integrated Well Service
Saves Costly Rig Time
SCHLUMBERGER
1 TRIP TO THE WELL...
ALL OF THESE SERVICES
RADIO ACTIVE DEPTH MARKER
SIDEWALL CORING
DIRECTIONAL SURVEYS
DIPMETER SURVEYS
ELECTRICAL WELL LOGGING
Call SCHLUMBERGER for YOUR next GUN PERFORATING job — too.
SCHLUMBERGER

TABLE 2—RESERVOIR AND PRODUCTION DATA (Continued)

Study No.	Residual oil gravity (°A.P.I. at 60° F.)	Dissolved gas liberated at field trap pressure (cu. ft. per bbl.)	Saturation pressure at reservoir temp. (psig.)	Oil vol. factor (initial reservoir bbl. per stock tank bbl.)	Reservoir oil viscosity at init. conditions (cp.)	Depletion of ultimate prod. to date (per cent)	Average well spacing (acres per well)	Uniformity of spacing	Est. ultimate recovery (bbl. per ac.-ft.)
20	39	115	333	1.065	2.46	39.9	21.6	Uniform	306
21	31	....	....	1.060	*2.47	90.2	3.4	Uniform	530
22	37.2	....	....	1.100	*3.11	79.7	14.4	Uniform	213
23	39	960	3,355	1.490	0.67	21.9	39.1	Uniform	407
24	41	1,055	2,885	1.667	*0.59	98.7	27.0	Irregular	233
25	38.5	....	....	1.250	4.72	86.5	10	Uniform	247
26	33.2	143	531	1.100	*1.22	74.2	45.9	Nonuniform	437
27	26.3	114	758	1.070	16.8	47.2	26.4	Nonuniform	261
28	32	....	....	1.080	*2.12	34.7	46.8	Uniform	180
29	49	447	1,078	1.299	0.40	12.7	65.4	Uniform	280
30	49	110	374	1.105	0.54	2.6	57.7	Uniform	466
31	39.5	540	1,703	1.269	1.00	14.1	25.4	Nonuniform	390
32	38	300	685	1.176	*0.94	63.5	9.6	Uniform	396
33	25	*310	*2,300	*1.15	*3.22	49	37.8	Uniform	518
34	26	400	2,100	1.25	*3.17	59.5	21.2	Uniform	644
35	26	310	2,410	1.17	2.7	28.4	26.5	Uniform	629
36	39	230	520	1.14	*0.97	52.5	8.4	Irregular	354
37	20	....	....	*1.09	*11.4	100	4.8	Irregular	1,111
38	20	....	....	*1.09	*11.4	100	17.5	Irregular	1,121
39	38	750	*2,275	*1.25	*0.62	25.3	18.2	Uniform	742
40	22	*160	*1,250	*1.08	*8.7	59.3	9.0	Uniform	427
41	21	*370	*1,300	*1.17	*10.7	69	9.8	Uniform	398
42	44	482	1,506	1.25	*0.46	67	9.4	Uniform	547
43	39	916	4,615	1.51	0.45	20.4	65.6	Uniform	617
44	36.6	8	214	1.036	5.2	32.8	23.8	Uniform	429
45	38.2	8	117	1.016	3.63	37.5	15.6	Nonuniform	242
46	38.6	184	383	1.149	2.0	49.5	25.9	Uniform	256
47	38	435	985	1.280	1.7	54.5	22.1	Uniform	165
48	37	450	971	1.2	*1.04	56	18.4	Nonuniform	248
49	22.5	*100	*960	*1.05	*9.5	55.2	8.9	Uniform	500
50	24.5	*140	*1,050	*1.08	*5.0	52.5	9.7	Uniform	443
51	29.5	480	3,150	1.27	1.3	67.3	10.1	Uniform	811
52	35	600	3,265	1.30	0.70	15.8	20.0	Uniform	660
53	35	600	3,265	1.30	0.70	20.8	16.2	Uniform	660
54	35	600	3,265	1.30	0.70	18.8	21.4	Uniform	680
55	35	600	3,265	1.30	0.70	70.8	17.0	Uniform	382
56	43	200	715	1.15	0.95	38.1	18.3	Irregular	411
57	46.4	270	1,125	1.18	0.47	26.7	17.9	Nonuniform	460
58	38.2	565	2,250	1.30	0.58	25.1	18.1	Uniform	661
59	38.2	540	2,250	1.28	0.58	63.1	21.2	Uniform	600
60	39.3	365	740	1.27	0.96	42.1	4.9	Irregular	949
61	42.6	750	3,060	1.37	*0.41	37.6	20.4	Uniform	387
62	42.6	735	3,060	1.39	*0.41	73.3	26.1	Uniform	387
63	38.8	855	4,225	1.45	*0.48	57.5	18.3	Uniform	530
64	23.5	245	1,980	1.09	*4.77	65.4	23.6	Uniform	472
65	38.6	550	2,725	1.35	*0.57	61.4	20.4	Uniform	690
66	32.4	520	2,528	1.28	0.51	68.1	21.6	Uniform	500
67	44.2	800	2,400	1.47	0.45	68.2	13.9	Uniform	343
68	21.5	175	1,125	1.04	*10.1	82.3	31.2	Uniform	357
69	40	100	400	1.10	*0.84	100	2.8	Uniform	285
70	22.5	100	820	1.10	*7.8	52.9	10.8	Uniform	453
71	33.1	365	1,800	1.19	*1.03	28 5	17.4	Irregular	674
72	33.1	365	1,800	1.19	*1.03	58.5	14.4	Irregular	592
73	22	125	1,000	1.12	*8.0	76.4	9.8	Uniform	505
74	28.5	260	1,550	1.16	1.37	39	17.0	Irregular	520
75	22	210	1,804	1.10	4.2	50.5	13.6	Irregular	552
76	19.5	225	1,985	1.11	*13.2	50.4	32.5	Irregular	540
77	23	260	2,253	1.12	*4.67	53.7	16.4	Irregular	540
78	22	20	140	1.05	*6.6	48	8.8	Irregular	430
79	25.5	330	2,430	1.16	1.4	26.6	18.3	Uniform	682
80	24.4	160	1,450	1.08	*4.0	63.8	18.7	Uniform	560
81	25.4	340	2,490	1.16	*2.78	25.2	19.7	Uniform	682
82	25.4	230	2,000	1.10	*3.11	25	14.8	Uniform	500
83	35.7	550	2,725	1.35	*0.72	29.8	20.4	Uniform	625
84	35.7	550	2,725	1.35	*0.72	12.6	20.3	Uniform	771
85	34.8	300	1,250	1.25	*0.99	42.7	7.7	Irregular	683
86	33 1	40	....	1.03	*1.62	51.9	5.9	Irregular	225
87	29.5	440	2,705	1.21	1.5	10.9	19.9	Uniform	595
88	37.9	800	4,400	1.43	0.45	77	37	Irregular	815
89	37	900	4,400	1.43	0.45	86	34	Irregular	1,030
90	43.5	800	3,040	1.33	*0.52	94	23	Irregular	963
91	40.2	800	3,200	1.33	*0.54	99	14	Irregular	1,165
92	36	....	. ..	1.37	0.67	74	8.3	Irregular	563
93	36	....	....	1.44	0.60	75	10.5	Irregular	410
94	36.5	....	....	1.50	0.56	80	6.4	Irregular	126
95	36	....	....	1.54	0.50	89	4.6	Irregular	180
96	30.5	....	....	1.17	2.0	85	3.5	Irregular	743
97	34	....	....	1.21	1.1	87	2.6	Irregular	688
98	33.5	....	....	1.25	0.95	86	7.0	Irregular	445
99	33	....	....	1.30	0.90	86	5.0	Irregular	443
100	33	....	....	1.38	0.79	89	6.0	Irregular	307
101	16.5	....	....	1.05	158	60	6.5	Irregular	540
102	31	....	....	1.24	1.42	83	7.0	Uniform	402
103	32	....	....	1.35	1.08	80	5.0	Irregular	412

*Estimated. †Produced gas and water return begun mid-1945. ‡Estimated normal recovery (field being repressured. §Small gas return project operating. ¶Estimated normal recovery (field being repressured).

range from 40 to 5,000 md. Interstitial (or connate) water varies from 10 to 42.5 per cent of the total pore volume, and averages 28 per cent. The average reservoir temperature is 153° F. Oil gravities cover essentially the entire range of gravities usually encountered, extending from 16.5° to 49° A.P.I. The viscosities of the individual oils, at reservoir pressure and temperature, range from 0.40 to 158 cp. The reservoir pressure declines show that some fields have operated under strong water drives with high degree of pressure maintenance, whereas others have experienced pressure drops approaching 100 per cent of the initial pressures. Average well spacings range from 2.6 to 65.6 acres per well. The estimated ultimate recoveries for these fields vary from 242 to 1,165 bbl. of stock tank oil per acre-foot.

Conversion to Residual Saturations

As in the case of the gas-drive fields, it would facilitate a study of the true effect of well spacing on recovery efficiency if it were possible to exclude those differences in recovery which are the result of differences of porosity, connate water, and oil shrinkage. The porosity and connate water directly govern the amount of oil originally in place and, hence, the quantity of recoverable oil for a given recovery efficiency. The shrinkage of the oil as gas is liberated from solution affects the volume of oil recovered in the stock tank. Fortunately, for water-drive fields the per cent of the pore space in the reservoir left filled with oil at depletion is substantially independent of these volumetric effects and can thus be used as an index of recovery efficiency. The indicated ultimate recoveries of the water-drive fields have, accordingly, been converted to residual oil saturations, expressed as percentages of the total pore space. For the fields considered, these residual oil saturations range between 17.9 and 60.9 per cent.

To determine for these water-drive sand fields the relation between oil recovery and well spacing, the residual oil saturations have been plotted against the respective average well spacings in Fig. 2. The viscosity ranges are indicated in the legend. It is observed that the majority of the points are quite scattered throughout the range of well spacing studied, and are distributed between 20 and 60 per cent residual oil saturation. A statistical average of all the data indicates a residual oil saturation of approximately 36 per cent of the total pore space. No trend with well spacing is evident. From this lack of correlation between residual oil saturation and well spacing it appears that there is little, if any, evidence of a relation between the recovery of oil and well spacing for these fields over the wide range

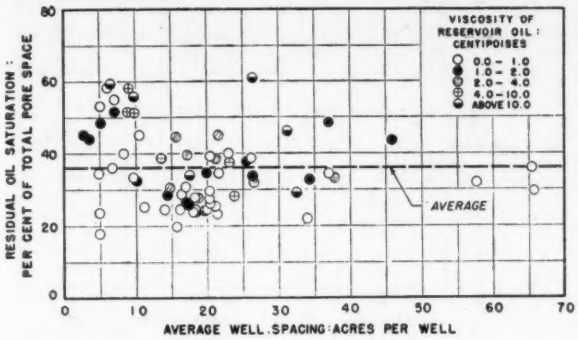

RESIDUAL OIL SATURATION : PER CENT OF TOTAL PORE SPACE
AVERAGE WELL SPACING: ACRES PER WELL
VISCOSITY OF RESERVOIR OIL : CENTIPOISES
0.0 - 1.0
1.0 - 2.0
2.0 - 4.0
4.0 - 10.0
ABOVE 10.0
AVERAGE

Fig. 2—Relation between residual oil saturation and well spacing —water-drive sand fields

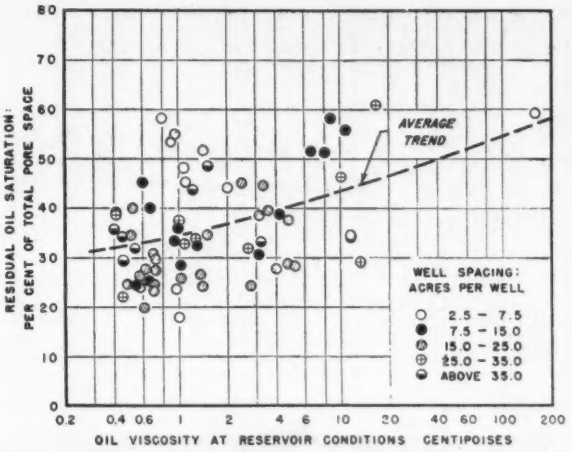

RESIDUAL OIL SATURATION : PER CENT OF TOTAL PORE SPACE
OIL VISCOSITY AT RESERVOIR CONDITIONS CENTIPOISES
AVERAGE TREND
WELL SPACING: ACRES PER WELL
2.5 - 7.5
7.5 - 15.0
15.0 - 25.0
25.0 - 35.0
ABOVE 35.0

Fig. 3—Effect of oil viscosity on residual oil saturation—water-drive sand fields

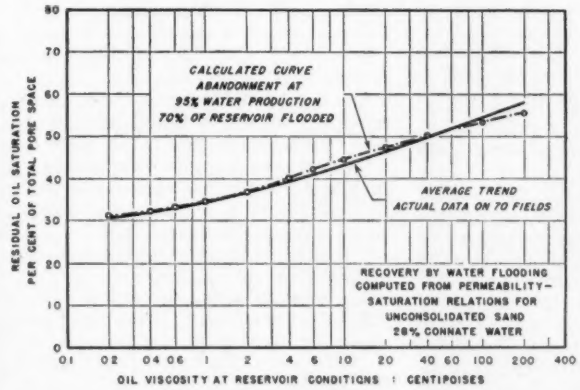

RESIDUAL OIL SATURATION PER CENT OF TOTAL PORE SPACE
OIL VISCOSITY AT RESERVOIR CONDITIONS : CENTIPOISES
CALCULATED CURVE ABANDONMENT AT 95% WATER PRODUCTION 70% OF RESERVOIR FLOODED
AVERAGE TREND ACTUAL DATA ON 70 FIELDS
RECOVERY BY WATER FLOODING COMPUTED FROM PERMEABILITY-SATURATION RELATIONS FOR UNCONSOLIDATED SAND 28% CONNATE WATER

Fig. 4—Comparison between actual and calculated effect of viscosity on residual oil saturation—water-drive sand fields

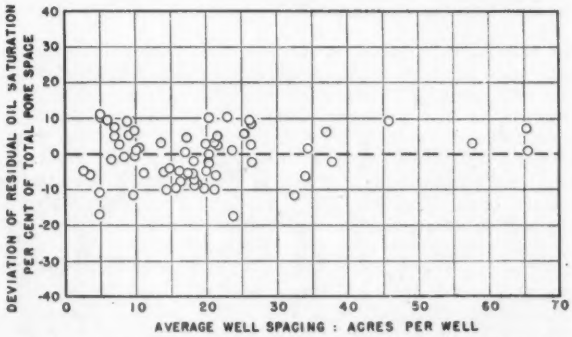


Fig. 5—Relation between deviation of residual oil saturation from average trend in Fig. 3 and well spacing—water-drive sand fields

of spacings from 2.6 to 65.6 acres per well.

Although the data on water-drive sand reservoirs are sufficiently numerous to give considerable support to a purely statistical approach, nevertheless, specific attention may be focused more sharply on well spacing, and the data evaluated better, by investigating some of the factors other than porosity, connate water, and shrinkage which might influence the recovery to such an extent as to prevent the determination of any effects which well spacing alone might exhibit in the absence of these other effects.

Viscosity of the oil is an important factor which is known to influence the recovery of oil and which must be considered. To determine its effect, the residual oil saturations have been plotted against the viscosity of the oil at reservoir conditions in Fig. 3. The points are again widely distributed, but it is apparent that there is a definite trend of the residual oil saturation with viscosity. The average trend, indicated by the heavy dashed line through the points, shows that the residual oil saturation increases as viscosity increases. Throughout the range of viscosity investigated, more than 70 per cent of the points lie within a range of 10 per cent saturation on either side of this average trend.

In order to determine whether or not the trend of residual oil saturation with viscosity represented by the curve drawn through the data in Fig. 3 might have been anticipated, a calculation has been made of the effect of viscosity on residual oil saturation based on published experimental measurements on the flow of oil and water in sand.[1] The results of this calculation are represented by the dotted curve in Fig. 4. It will be noted that the curve drawn through the actual data on the 70 water-drive fields in Fig. 3 and the calculated curve are quite similar. The calculation was based on the same average porosity and connate water as the 70 water-drive fields, and it was assumed that 70 per cent of the sand would be flooded to a condition such that it would produce 95 per cent water. The agreement between the actual and calculated trends indicates that the observed effect of viscosity on residual oil saturation is logical and could have been anticipated.

The irregularities in the magnitudes of the saturations at various viscosities shown in Fig. 3 are apparently caused by other influencing factors besides viscosity. To investigate the possibility that well spacing might be an underlying cause of the observed variations, the deviations in residual oil saturation from the average trend of saturation vs. viscosity in Fig. 3 have been plotted against the individual well spacings in Fig. 5. It is observed that the points are still scattered, and that they still follow no definite trend with well spacing. The zero deviation line is approximately the average line through these points. This indicates that the well spacing did not affect the deviation of the saturations from the average viscosity-saturation trend. The fact that elimination of viscosity as a factor which might have hidden any relation between oil recovery and well spacing in Fig. 2 still reveals no relation between recovery and well spacing lends weight to the conclusion drawn from Fig. 2 that these field data do not show a dependence of the oil recovery on the well spacing.

Another factor which might so affect the recovery as to hide any possible influence of well spacing is the magnitude of the decline in reservoir pressure. The decline in pressure may be an indirect index of the degree to which operating practices utilize

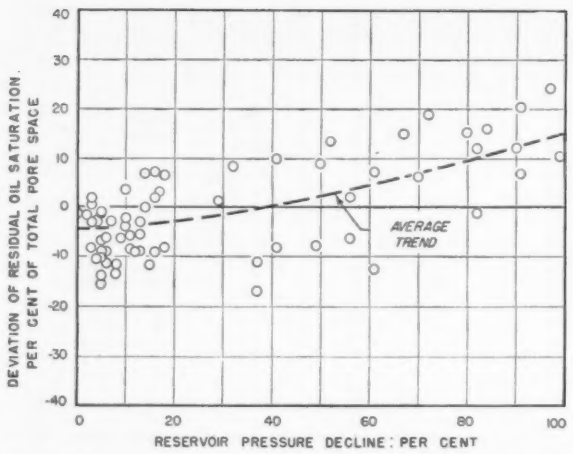


Fig. 6—Relation between deviation of residual oil saturation from average trend in Fig. 3 and pressure decline—water-drive sand fields

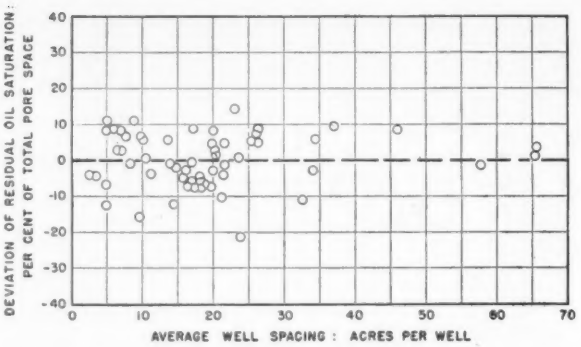


Fig. 7—Relation between deviation of residual oil saturation from average trend in Fig. 6 and well spacing—water-drive sand fields

the available expulsive forces, and thus may be a measure of the recovery efficiency. To determine the influence of the pressure decline on the observed results, the deviations of residual oil saturation from the average saturation-viscosity trend in Fig. 3 have been plotted in Fig. 6 against the total pressure decline experienced to date, expressed as a per cent of the initial reservoir pressure. The average trend through these points shows that the fields with the highest degree of pressure maintenance will have the highest recoveries. Such a result is to be expected; it is a verification of the fact that efficient oil recovery may be obtained through proper reservoir control. The pronounced trend shows the benefits of maintaining reservoir pressure at a comparatively high level throughout production operations.

To eliminate any possible effects of variation in the degree of pressure maintenance which might hide a possible relation between well spacing and recovery, the deviations in residual saturation from the average trend shown in Fig. 6 have been plotted against well spacing in Fig. 7. The points are still scattered, although to a much lesser extent than in Fig. 2 and again no definite trend with spacing appears. The deviations are fairly uniformly distributed above and below zero deviation axis. Fig. 7 shows that the pressure decline has not hidden any effect of well spacing on recovery, and again shows that there is no evidence in these field data that the recovery of oil from these fields is dependent on their well spacing. This further corroborates the conclusion drawn from Fig. 2.

It has now been shown that the effects of viscosity and pressure decline on oil recovery are pronounced and definite, but they have not been such as to conceal a relation between recovery and well spacing. Because of its important influence on recovery, one additional factor, viz., the permeability of the formation, must also be given consideration. The permeability of a formation governs the rate at which oil can be displaced with a given pressure gradient; and, through its influence on the effectiveness with which gas or water flushes the formation, it may affect the recovery indirectly. The effect of permeability on the residual oil saturation is thus interrelated with the effects of rate of production, pressure decline, and flushing efficiency.

To isolate the effect of sand permeability on the residual oil saturation, the deviations of the residual oil saturations from the average trend in Fig. 6 are plotted against the permeability in Fig. 8. The data show a trend toward decreased residual oil saturation (or increased oil recovery) with increasing permeability.

To eliminate the observed influence of permeability on the data, and again to investigate the possible effect of well spacing, the deviations of the residual oil saturations from the average trend shown in Fig. 8 have been plotted against the well spacing in Fig. 9. As in Fig. 2, 5, and 7, the data points are somewhat scattered, but the average deviation is zero, and the points are randomly distributed above and below the zero deviation line—showing no dependence of the residual oil saturation on the well spacing.

It is significant to note that in Fig. 9 the observed effects of oil viscosity, reservoir pressure decline, and permeability have all three been eliminated through a cumulative process. The elimination of the effects of these variables has materially reduced the scattering of the points—only 9 points in Fig. 9 deviating from zero by as

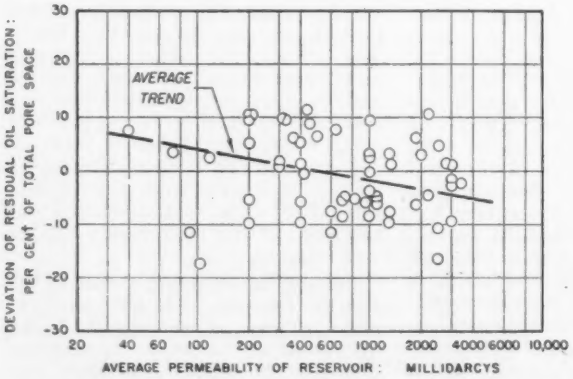

DEVIATION OF RESIDUAL OIL SATURATION: PER CENT OF TOTAL PORE SPACE
AVERAGE TREND
AVERAGE PERMEABILITY OF RESERVOIR: MILLIDARCYS

Fig. 8—Relation between deviation of residual oil saturation from average trend in Fig. 6 and permeability—water-drive sand fields

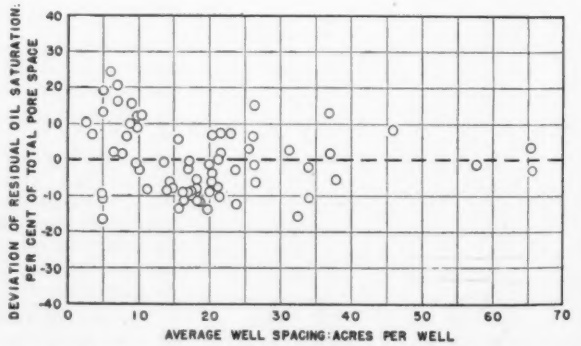


Fig. 9—Relation between deviation of residual oil saturation from average trend in Fig. 8 and well spacing—water-drive sand fields

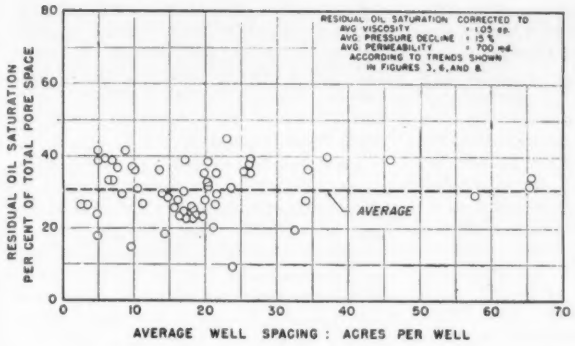


Fig. 10—Relation between corrected residual oil saturation and well spacing—water-drive sand fields

much as 10 per cent residual oil saturation, as compared with 27 points deviating to a corresponding extent from the average in Fig. 2. Although Fig. 9 contains only 59 points, as compared with 70 in Fig. 2, because of the fact that the required data for all of the corrections were not available on 11 of the fields, the reduction in scattering did not result from omission of the 11 points. Of the 27 points in Fig. 2 which differed from the average by 10 per cent residual oil saturation, only 4 have been omitted from Fig. 9.

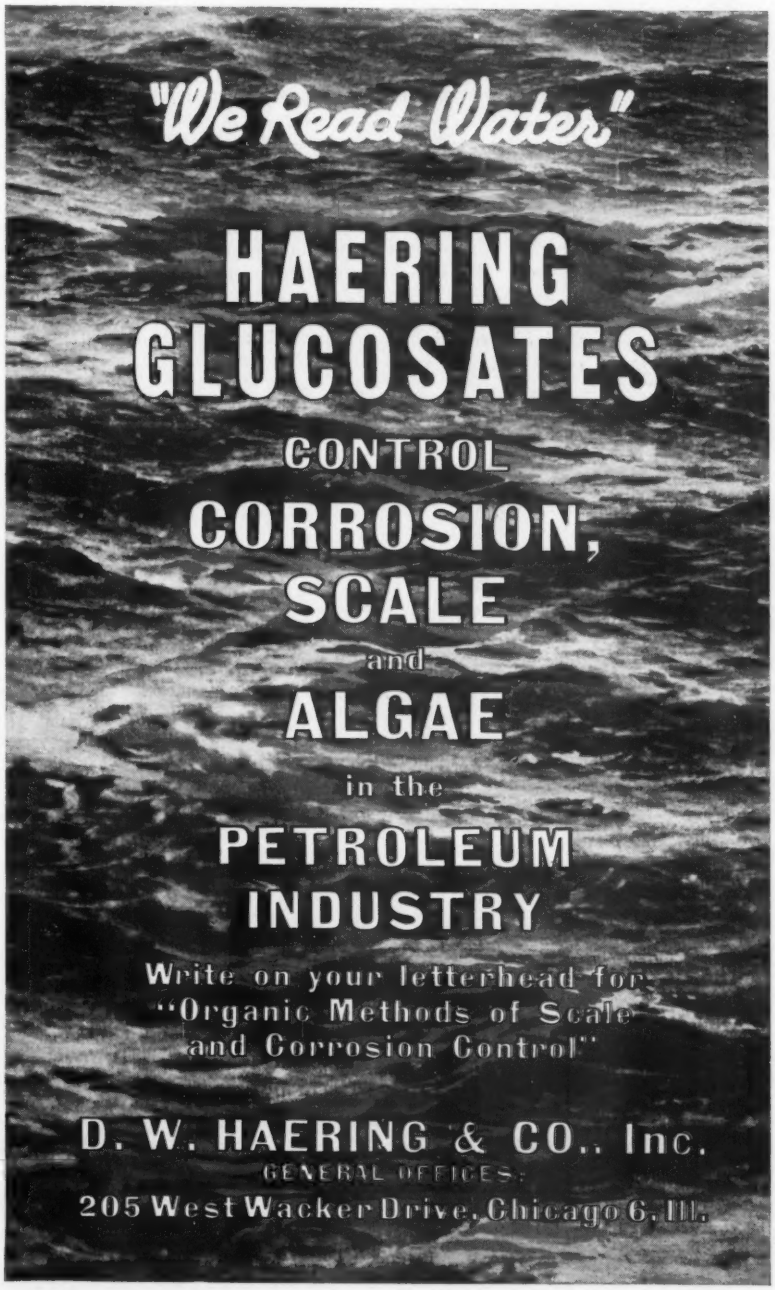
To facilitate understanding of the significance of Fig. 9, the data have been replotted in Fig. 10 to show directly the residual oil saturation for each field corrected to the average oil viscosity, average pressure decline, and average permeability. The corrections for these quantities were made by use of the slopes of the trends shown in Figs. 3, 6, and 8. The average viscosity, pressure decline, and permeability to which the data were adjusted are indicated in Fig. 10, and were chosen as the values above which and below which there was an equal number of fields. Fig. 10 is comparable to Fig. 2, except that it shows the variations in residual oil saturation which would exist if all of the fields studied had the same oil viscosity, the same reservoir pressure decline, and the same permeability.

In Fig. 10, as in the preceding Figs. 2, 5, 7, and 9, there is no apparent relationship between the corrected residual oil saturation and the well spacing—the deviations from the average being randomly distributed above and below 30.5 per cent regardless of the well spacing. Thus, Fig. 10 again shows (but more definitely than Fig. 2) that there is no evidence in these data of a direct relationship between ultimate oil recovery and well spacing for the water-drive sand fields studied.

No attempt was made to analyze by similar procedure the data for the lime and dolomite fields. Of the six fields on which information was available, complete porosity and connate water data were available for only two. The small number of fields in this group and the lack of adequate data prevented the possibility of any sound study of the possible effects of well spacing on their recovery.

Conclusions

The approach used in Figs. 2 through 10 to try to isolate and identify a possible effect of well spacing on recovery may be criticized on the basis that the variables viscosity, pressure decline, and permeability, which were found to affect the recovery, were not simultaneously held constant for comparison of recovery against well spacing. Carrying the



criticism further, other factors which were not taken into account might also affect the recovery. In effect, this criticism gets at the root of the difficulty of the direct field study of the effects of well spacing. To determine conclusively from direct comparison of ultimate recoveries that well spacing does or does not affect the recovery would require comparison of the ultimate recoveries of fields which were identical in every detail except the well density. Such comparison will never be possible, for obvious reasons. Another approach to such a comparison may be made, however, by determining the effects of and correcting for each of the factors other than well spacing which might affect the ultimate recovery, and then comparing the corrected ultimate recovery with the well spacing. Such an attempt was made in Fig. 10. Thus, in the course of the analysis of oil recovery in water-drive sand fields the effects of porosity, connate water, and shrinkage were eliminated, and the effects of oil viscosity, pressure decline, and permeability were systematically evaluated (and also eliminated) to determine whether a relation exists between oil recovery and well spacing. No such relationship was found.

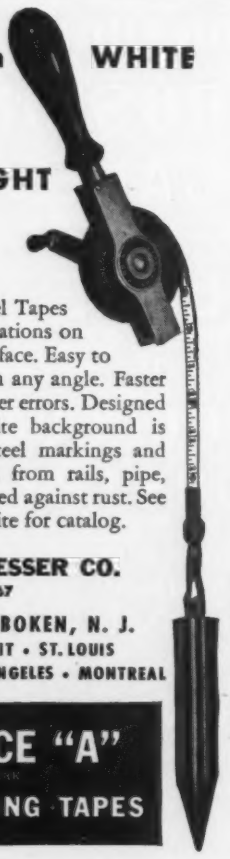
The pertinent question remaining is whether the absence of a discernible trend of the data with well spacing actually proves conclusively that oil recovery for these fields is, in fact, independent of their well spacing. Such a conclusion is suggested by the absence of evidence to the contrary. However, even in Fig. 10, after correction for the major factors influencing the recovery, there remains considerable scattering of the data. Such scattering is evidence either of inaccurate data on porosity, connate water, shrinkage, sand thickness, and estimates of ultimate recovery, or of the effects of influences other than those taken into account, such as structural configurations of the reservoirs, gas and water production, rates of production, and other items known to influence the ultimate recovery.

Although it may be admitted that a complete and detailed study of each reservoir would be required to establish all of the reasons for the observed or expected recoveries, nevertheless, in a large number of data points it may be expected that the chance occurrence of unusually favorable conditions other than those considered will be randomly distributed and will not vary in a unidirectional manner with well spacing. Stated differently, both favorable and unfavorable conditions should be encountered at wide spacing and at close spacing. In a large number of observations, therefore, variations of recovery due to such effects should be statistically distributed in such manner as to be superimposed on, rather than to counteract or hide, the effect of a systematic variation with well spacing.

Referring again to Fig. 2, it may be noted that no systematic variation of ultimate recovery with well spacing is evident, even though the effects of viscosity, pressure decline, and permeability—which are known to be present and to be of appreciable magnitude—have not been eliminated in Fig. 2. High and low viscosity, pressure decline, and permeability are all encountered in the observed data, but these conditions are randomly distributed. Superimposed on these random distributions are the trends observed in Figs. 3, 6, and 8, wherein the specific effects of viscosity, pressure decline, and permeability have each been determined in spite of other random effects not taken into account. These results indicate that the effects not taken into account are, in fact, randomly distributed among the fields investigated, and that the number of observations is adequate to detect any real trends which might exist.

This conclusion is borne out by the fact that the effects of oil viscosity, pressure decline, and permeability

BLACK on WHITE
for
BETTER SIGHT



WYTEFACE "A" Steel Tapes have *raised* black graduations on a crack-proof white surface. Easy to read in any light, from any angle. Faster measurements with fewer errors. Designed for hard service. White background is protected by raised steel markings and rims. Resists abrasion from rails, pipe, rocks, concrete. Protected against rust. See your supply house. Write for catalog.

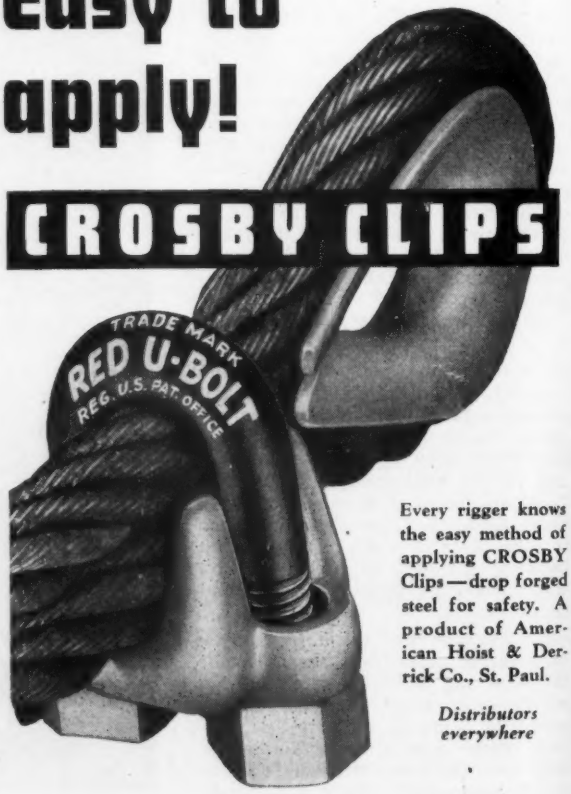
KEUFFEL & ESSER CO.
EST. 1867
NEW YORK • HOBOKEN, N. J.
CHICAGO • DETROIT • ST. LOUIS
SAN FRANCISCO • LOS ANGELES • MONTREAL

WYTEFACE "A"
STEEL GAUGING TAPES

K+E
Drafting
Reproduction
Surveying Equipment
and Materials
Slide Rules
ering Tapes

Easy to apply!

CROSBY CLIPS

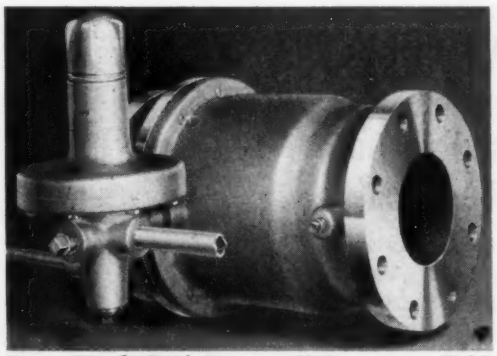


Every rigger knows the easy method of applying CROSBY Clips—drop forged steel for safety. A product of American Hoist & Derrick Co., St. Paul.

Distributors everywhere

MAINTAINING A *FIXED* *Fluid Level* . . . 6 MILES AWAY!

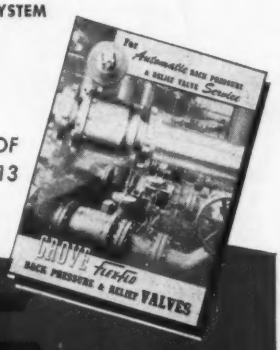
One of the many outstanding Grove Back Pressure installations is illustrated at right. In this application the Grove Flexflo Back Pressure Regulator is maintaining a constant head on an elevated 6-mile waste water line—automatically controlling the discharge of hot salt water. These units are especially suited for handling highly corrosive, erosive and hazardous fluids with no possibility of seepage or leakage. Positive bubble-tight shutoff is assured.



Grove Flexflo Back Pressure Valves are available in a full range of sizes for high and low pressure service.

- ★ POSITIVE BUBBLE TIGHT SHUTOFF
- ★ HIGH FLOW CAPACITY
- ★ MAXIMUM CONTROL-ACCURACY
- ★ NO STUFFING BOXES OR PACKING GLANDS
- ★ NO FIXED ORIFICES IN CONTROL SYSTEM

SEND TODAY FOR YOUR COPY OF NEW BULLETIN #813



GROVE *flex-flo* BACK PRESSURE and RELIEF VALVES

GROVE REGULATOR COMPANY

6529 HOLLIS STREET, OAKLAND 8, CALIFORNIA • *Eastern Sales and Export Office:* 30 Rockefeller Plaza, New York City
Factory Branches: 108 Portwood, Houston, Texas • 1930 West Olympic Boulevard, Los Angeles 6, California

were readily apparent from the data and could be evaluated. Accordingly, even though the data are not precise, it is believed that the number of observations is sufficient to afford reasonable statistical support for the position that the absence of a trend with well spacing is significant rather than accidental. Hence, the further conclusion may be justified that these field data show the ultimate oil recovery to be independent of the well spacing.

For clarification, this conclusion needs elaboration and explanation. What has been shown by these data is that distance between wells is not one of the pertinent generally applicable physical factors upon which oil recovery is dependent. This conclusion does not imply that a single well will adequately drain an entire structure, nor does it imply that the recovery from any field will necessarily be independent of the number and location of producing wells. The data show an absence of a direct physical dependence and not an absence of a gometric dependence of recovery on spacing. For example, the field with 2.6 acres per well may be highly faulted or may consist of numerous zones not co-extensive. A well density of 65 acres per well in this field might have yielded materially less oil. Conversely, however, a density of 1 well to 2.6 acres in the field drilled to 65.6 acres per well would not necessarily have increased the ultimate recovery. Although distance of drainage is not a factor controlling ultimate recovery, the geometry of the reservoirs and the location of the wells with respect to such geometry are undoubtedly important. Furthermore, the effects of well location and production rate on gas and water production may also affect the ultimate oil recovery.

Hence, a more comprehensively phrased conclusion must point out that in any reservoir a sufficient number of wells must be drilled adequately to drain the reservoir under the available conditions and type of drive operative and to supply the desired total rate of production without excessive individual well rates. This minimum number of wells required is subject to determination on a sound engineering basis for each reservoir, based upon the reservoir characteristics and the type of operation. Beyond this minimum number of wells, further increase of well density will not increase the ultimate oil recovery through shortening the drainage distance. It is in this sense, and this sense only, that oil recovery has been shown to be independent of the well spacing.

Acknowledgment

The authors wish to express their appreciation to the special study committee on well spacing and allocation of production of the American Petroleum Institute for making available the data which formed the foundation for this paper. They further express their appreciation to L. W. Gibson and A. E. Hoffmann for their valuable assistance.

References

1. M. C. Leverett, "The Flow of Oil-Water Mixtures Through Unconsolidated Sands," Trans. A.I.M.E. 132, 149 (1939).

BOOKS

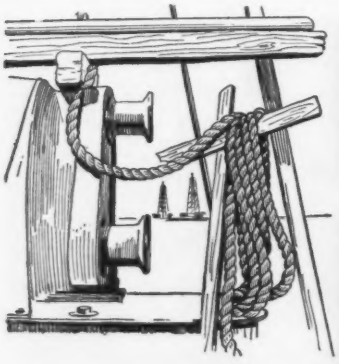
RUSSIA IN THE OIL AGE. By Andrew D. Perejda. Published in The American Review of the Soviet Union. 58 Park Avenue, New York. August 1946. 65 cents.

The production of Russian petroleum during the second world war, her reserves, and areas undergoing prospecting (geological and geophysical) have been matters of great conjecture. The purpose of this article is to elucidate some of the more salient aspects with regard to these problems, with particular emphasis placed on areas undergoing prospecting—especially in Siberian U.S.S.R.

VAPOR ADSORPTION. By Edward Ledoux. Published by Chemical Publishing Co., Inc., Brooklyn. 360 pp. $8.50.

During the past decade an ever-increasing interest has been focused on the phenomenon of adsorption and on industrial ad-

(Continued on page 121)



TREAT YOUR ROPE RIGHT

BULL ROPES
CAT LINES
TORPEDO LINES
SPINNING LINES
CRACKERS
CABLE TOOL LINES

While good rope is still scarce it pays to take care of the rope you have. Here is one very simple way to prolong rope life.

To the derrick floor add a short post and horizontal arm on which the coil of derrick line may be hung between jobs —and use it. It keeps the line out from under foot and possible scuffing—gives it a chance to air out and dry thoroughly. It also reduces chances of mildew or rot and premature breakdown of the rope fibers.

And when you do buy new rope specify New Bedford! That Pays Too!

NEW BEDFORD CORDAGE CO.
233 BROADWAY · NEW YORK 7, N. Y.
31 St. James Ave., Boston 16, Mass. · 325 W. Huron St., Chicago, Ill.
Mills: New Bedford, Massachusetts

A Pint of Likker Used to Do the Trick

Time was when you could give a customer a pint of "likker" and he'd buy anything.

Those days are gone and good riddance, we say.

Oil is serious business and for 26 years we have been dead serious about the way Jensen Pumping Units are made and sold. No fancy frills — big and little customers always treated alike. Ask them — customers are our best salesmen.

JENSEN
BROTHERS MFG. CO.
Coffeyville, Kansas, U. S. A.
Export Office: 50 CHURCH STREET, NEW YORK CITY

sorption processes. Static adsorption is studied only from the engineer's viewpoint, who is really more interested in the next step, industrial dynamic adsorption, a vast field he has to explore for himself. The physical and physicochemical background of adsorption, the essentials of vapor and heat transfer, and saturation of air are also discussed to help the engineer in the clear understanding and application of adsorption phenomena to industrial projects. The building and operation of dynamic adsorption units on an industrial scale and various adsorption problems are treated with great thoroughness and lucidity.

ENGLISH-FRENCH AND FRENCH-ENGLISH TECHNICAL DICTIONARY. By Francis Cusset. Chemical Publishing Co. Brooklyn. 590 pp. $5.

This handy volume was compiled to help the technical man in reading French technical texts. Translators, librarians, and students will find it equally useful. The English equivalents of French expressions and vice versa, were chosen with competence and accuracy.

Adjustable Safety-Belt Tail Line

by Henry W. Boggess*

THROUGHOUT the years it has been apparent that the use of manila rope as a tie between the belt of a man working on an elevated platform in a derrick and some member of the derrick has not been satisfactory. This is true because:

1. Manila rope has a known strength when new but after being subjected to the elements, to oil and salt water and to injury from being thrown in tool boxes, the factor of safety becomes conjectural.

2. The method of tying manila rope safety belt tail lines on to the derrick has been more or less up to the choice of derrick men. Such lines might be tied to a derrick leg, to a girt or a sway brace. It might be tied on the girt immediately behind the derrick man or to some overhead girt.

3. There has been no control over the kind of knot the derrick man chose to use in tying onto the derrick, hence life has been jeopardized by unsafe ties.

4. There has been no control over the length of slack between the tie on the derrick and the splice into the D-ring on the safety belt. It is not unusual for derrick men to leave too much slack lying on the working platform. A fall under such circumstances might mean a drop of as much as 10 ft., subjecting the rope, the tie and the belt to unnecessary shock and strain.

Use of a small diameter flexible metal line with hooks at each end, as a safety belt tail line, has presented a problem as to how the derrick end could be controlled by positive tie to derrick. The accompanying drawing illustrates the method worked out by Sinclair Prairie Oil Co., after several months of experiments. It should be understood that this method is not intended for drilling wells, although with variations it might be adapted to drilling platforms. It has been designed and is being used for rod and tubing jobs on pumping derricks.

An "adjustable extension" between the derrick end of the tail line and the point to which the derrick end of the adjustable extension fastens to the derrick, is the thing that makes the system successful. Regardless of whether a derrick board is placed on or immediately below or at any point between two girts, the adjustable extension makes it possible always to keep the tail line reasonably taut.

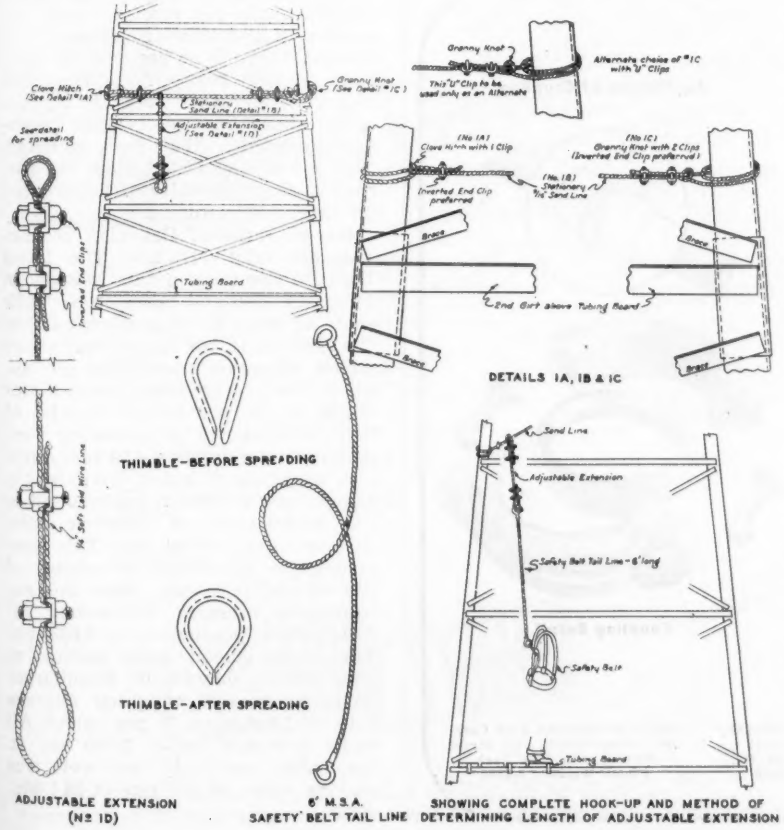
By hooking the tail line onto a stationary line that is permanently fastened to the legs of the derrick, it will be found that this adjustable extension will move from side to side as the workman moves in either hanging rods, stacking tubing or operating his elevator. This eliminates the necessity of slack in the line to give the workman freedom on the board and, at the same time, insures that he cannot actually fall off the board.

As a workman cannot fall off a board, the drop test on the tail line will require less poundage. The old method of having a safety factor of three on manila rope meant that manila rope should stand a drop test of 300 lb. at 8 ft. or 2,400 lb. × 3 as a factor of safety. The system presently employed eliminates the drop test entirely and requires only sufficient tail line strength to stand the weight of a man without a drop. Therefore, by using a metal tail line in lieu of manila rope, the factor of safety is increased from three to twelve or more.

Sinclair Prairie Oil Co.'s attempt at solving the problem of controlling the safety of a derrick man is progressive. The attached drawing details the first attempt. No doubt evolution will improve the system.

*Superintendent of Personnel Department, Sinclair Prairie Oil Co.

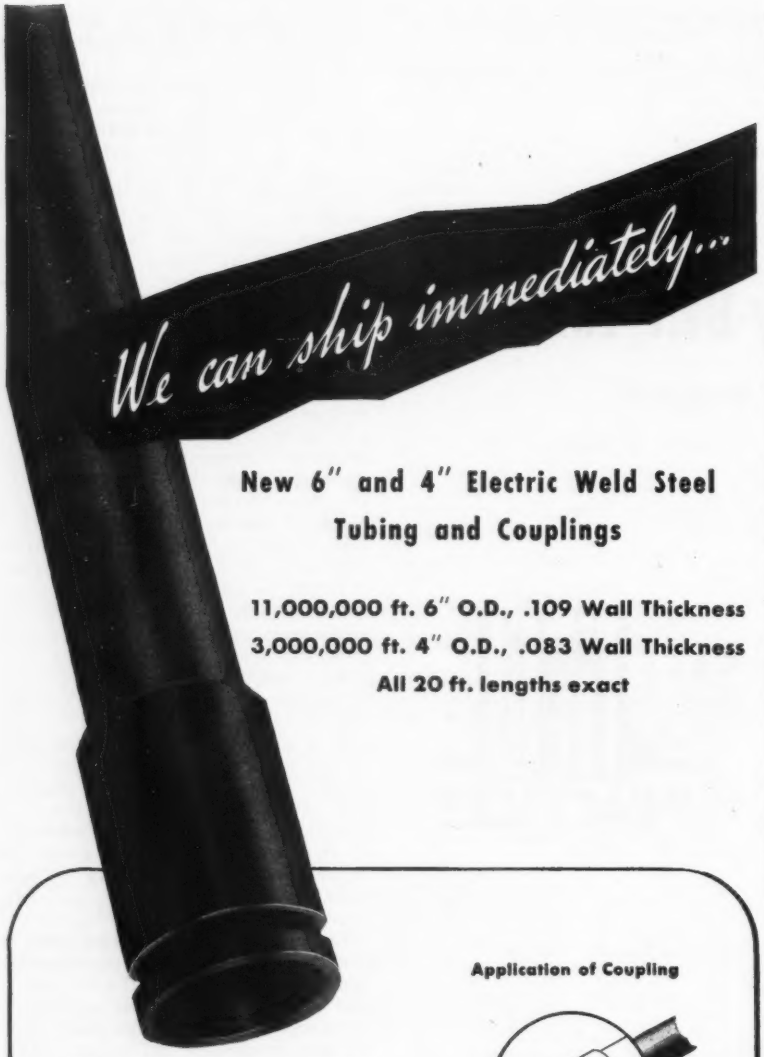
SAFE Field PRACTICES


Granny Knot
Alternate choice of "1C with "B" Clips
This "U" Clip to be used only as an Alternate
Clove Hitch (See Detail "1A")
Granny Knot (See Detail "1C")
Stationary Send Line (Detail "1B")
Adjustable Extension (See Detail "1D")
Swedge for spreading
Inverted End Clips
Tubing Board
(No. 1A) Clove Hitch with 1 Clip
(No. 1C) Granny Knot with 2 Clips (Inverted End Clip preferred)
Inverted End Clip preferred
(No. 1B) Stationary 7/16" Send Line
Brace
End Girt above Tubing Board
DETAILS 1A, 1B & 1C
THIMBLE-BEFORE SPREADING
THIMBLE-AFTER SPREADING
Send Line
Adjustable Extension
Safety Belt Tail Line - 6' long
Safety Belt
Tubing Board

ADJUSTABLE EXTENSION (No. 1D)

6' M.S.A. SAFETY BELT TAIL LINE

SHOWING COMPLETE HOOK-UP AND METHOD OF DETERMINING LENGTH OF ADJUSTABLE EXTENSION



New 6" and 4" Electric Weld Steel Tubing and Couplings

11,000,000 ft. 6" O.D., .109 Wall Thickness
3,000,000 ft. 4" O.D., .083 Wall Thickness
All 20 ft. lengths exact

This tubing is new, excellent and has been hydrostatically tested to 900 pound pressure p.s.i. Every 20 foot length of tubing has welded on each end a 6" (6⅝" O.D.) or 4" (4½" O.D.) pipe nipple which is grooved for use with Victaulic type coupling.

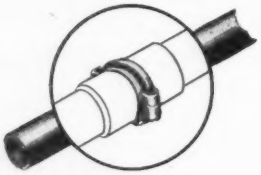
This tubing is recommended for normal use and application on steam, oil, gas and water lines, for columns and other structural purposes.

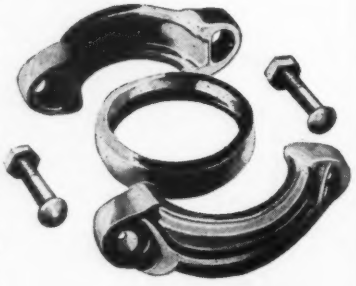
Prompt shipments can be made from various locations throughout Ohio, Pennsylvania, New York, New Jersey, Illinois, Missouri and Virginia.

Prices will be submitted upon application, and special arrangements are available to jobbers.

Representative samples of both sizes of couplings and tubing may be inspected at our various warehouses.

Application of Coupling





Coupling Detail

Albert Pipe Supply Company
Berry & North 13th Street
Brooklyn 11, New York
Phone Evergreen 7-8100

L. B. Foster Company
P.O. Box 1647
Pittsburgh 30, Pa.
Walnut 3300

Albert & Davidson Pipe Corp.
2nd Avenue—50th, 51st Street
Brooklyn 32, New York
Phone Windsor 9-6300

TXL Representative of New Pre-Permian Fields

(Continued from page 84)

through or into the formation and are completed through perforations. In comparison with other fields, relatively little acidizing is done at TXL.

Since the two major producing horizons overlap very slightly no dual completions have been made in the field to date.

Core recoveries are comparatively poor, since the fractured formation tends to break up and plug the core barrel. Reverse circulation has been used in a few cases in coring, with almost 100 per cent recovery obtained, as against an average of 25 per cent with normal circulation. Cuttings give good control on most of the markers in the pre-Permian sections and some operators rely largely on them. The Ellenburger, hardest to recognize from cuttings, is most often cored. Circulation is sometimes reversed in drilling through markers, since the practice allows recovery of much larger cutting samples.

Reservoir Characteristics

The Devonian reservoir shows no indication of a water drive, and pressures have declined from 3,234 to 2,820 psi., in approximate relation to total withdrawals (see Fig. 1). The gas-saturation pressure is estimated to be 2,800 psi., therefore liberation of free gas in the reservoir and formation of a gas cap is believed imminent. There is no appreciable pressure gradient through the Devonian reservoir, and new wells show pressures approximating average reservoir pressure as they are completed. This is not unexpected, since the formation shows porosity of a fractured or cavernous nature.

Gas-oil ratios of Devonian production are relatively low. The latest Railroad Commission data released in February 1946 and based on 47 wells show all wells to be producing below the 2,000-cu. ft. per barrel limit above which allowable corrections are applied. The average ratio reported was 968.06 cu. ft. per barrel. A total of three wells shown in the survey were making water totaling 4.94 bbl. daily.

A pronounced water drive in the Ellenburger formation has resulted in the maintenance of reservoir pressure at about 4,060 psi. This precludes the possibility of release of gas in the reservoir, since the gas saturation pressure determined for Ellenburger production is 2,633 psi. The same gas-oil ratio survey as cited above showed 16 Ellenburger wells to have a weighted average ratio of 1,049.74 cu. ft. per barrel. All wells produced below 2,000 cu. ft. per barrel and only one well was making water, at the rate of 24.1 bbl. daily.

NOR-BRO-LOY

SWAGED NIPPLES

A special high quality product, precision-machined from solid bars of alloy steel selected for its high tensile strength and elastic limit. This special alloy was selected only after exhaustive tests of various alloys.

These swaged nipples are made in sizes from ¼-inch to 1½-inch inclusive.

Norris Brothers, INC.
ROBINSON · ILLINOIS

STANDARD OF THE OIL FIELDS

Gotkool

WATER CANS & COOLERS

GOTKOOL WATER CAN
Made in 1½, 2, 3, 5 to 15 and 20 gallon sizes. (Push Button Faucet at slight additional cost.)

GOTT Water Cans are the practical way to keep drinking water cool for long periods, protected from impurities and always handy to the job. Snug fitting large removable top, strongly built to withstand rough usage. Gott Water Coolers have extra large covers and a handy non-leaking push button faucet. Your Supply Store has them, get one today.

GOTKOOL WATER COOLER

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

KEEP PURE DRINKING WATER ALWAYS HANDY

INSIST ON THE GENUINE
Look for the Blue and Black Label with the name GOTKOOL in Red

SOMETHING NEW HAS BEEN ADDED

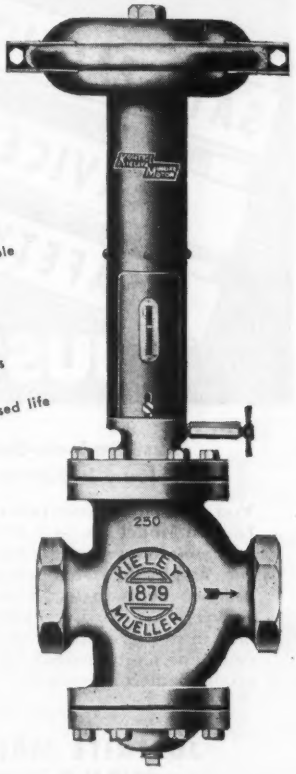
featuring

Kieley & Mueller presents

KONTROL MOTOR

Diaphragm Motor Valves
Pressure Regulators
Pump Governors

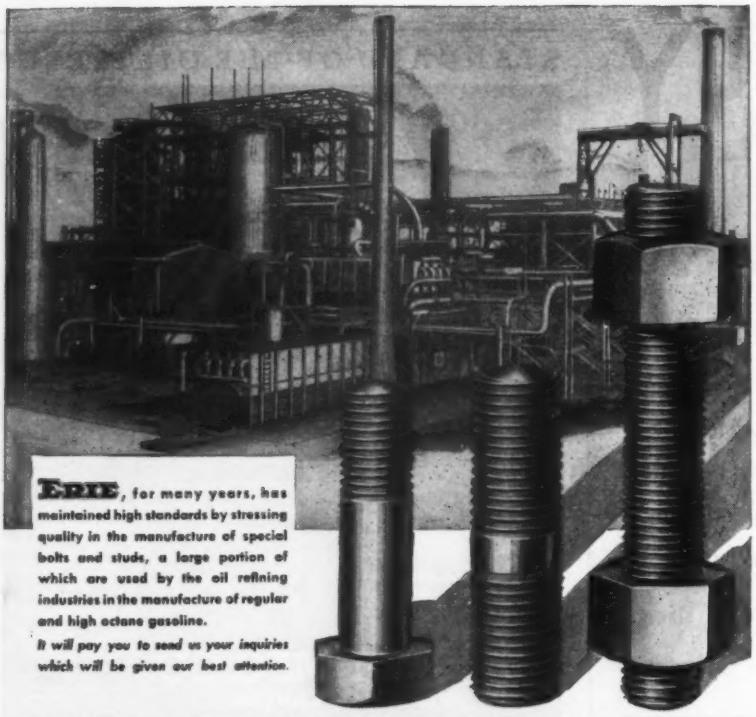
- **All Steel Diaphragm Motor Unit** . . . lighter, tougher, stronger, more durable
- **Boltless "Duoseal" Diaphragm Casing** . . . tight sealing, quick acting clamp ring; molded highly flexible neoprene diaphragm
- **Steel Tubular Yoke** . . . enclosing long, heat-treated, cadmium plated spring; packing gland and spring adjustment accessible through door
- **Valve Position Indicator** . . . standard equipment; no extra charge
- **High Capacity Valve Bodies** . . . unrestricted flow areas, smooth flow; available in bronze, semi-steel, cast steel, and special alloys
- **Superfinished Disc Guides** . . . top and bottom guided Bevel, Percentage V Port, and Parabolic discs; minimum friction, increased life
- **Modern Design** . . . to meet modern process requirements for better control



KONTROL KIELEY & MUELLER MOTOR

Write now for bulletin on the revolutionary KONTROL MOTOR valves.

KIELEY & MUELLER, INC., NORTH BERGEN, NEW JERSEY


ERIE, for many years, has maintained high standards by stressing quality in the manufacture of special bolts and studs, a large portion of which are used by the oil refining industries in the manufacture of regular and high octane gasoline.
It will pay you to send us your inquiries which will be given our best attention.

ERIE BOLT & NUT CO.
ERIE, PA.
STUDS • BOLTS • NUTS ~ ~ ALLOYS • STAINLESS • CARBON • BRONZE

Justrite Twin-Bulb Safety Lantern Leads In the Petroleum Industry—Gives Long, Satisfactory Service

You can't buy a better portable light than this all-purpose Justrite Electric Lantern Model No. 44-S. It's stood the test of time and won the approval of men who know good lights—it's approved by Underwriters' Laboratories, Inc., and by the U. S. Bureau of Mines. This Justrite Electric Safety Lantern has two bulbs in its "kick-out" bulb sockets that immediately eject a broken bulb. Fixed sparkproofed guard protects face of lantern. Body of lantern swings on center pivot, permitting beam to be focussed up, down, or at any angle desired. Movable handle can be moved to any position around lantern. Here's the portable electric lantern that's "Justrite"!

Available now!—from your regular supplier.

JUSTRITE MANUFACTURING COMPANY
2063 N. Southport Ave., Dept. G-1, Chicago 14, Ill.

Salt Water Disposal

(Continued from page 90)

require pump pressure up to 500 psi. On the wells into which are injected 4,000 to 5,000 bbl. per day 5 by 8 in. or 5 by 10-in. reciprocating pumps are used. (Fig. 3). On the wells where larger volumes are injected 6 by 12-in. or 7 by 12-in. reciprocating pumps are utilized. The 7 by 12-in. reciprocating pump will deliver 15,800 bbl. per day at 58 s.p.m. at 600 psi. This size pump has proven most popular on recently completed wells because of the large capacity available. Of course when smaller volumes are to be handled various sized liners are used.

In the reciprocating pumps, alloy-steel liners have given service up to 6 months. When ordinary cast-steel liners are used they usually have to be replaced at the end of 30 days. Some pump liners have been coated with plastics which gave satisfactory service. Further tests of various kinds of plastics and methods of application are being made.

Liners of 6-in. diameter and less have been made from brass tubing. These liners have given very good service notwithstanding the possibility of bimetallic electrolytic corrosion. Rubber pistons and valves and seats are used exclusively. The preliminary use of a special round rubber ring on a bronze head piston has indicated very good possibilities.

The Salt Water company has two vertical triplex pumps with porcelain plungers which have given excellent service. The operation has been continuous for many months without the necessity of any repairs. Although these pumps are more expensive than ordinary reciprocating pumps their longer life and low maintenance costs make them very desirable in salt water service.

Many Centrifugal Pumps in Use

Over 120 centrifugal pumps are in constant service in Salt Water company operations. These pumps are used for backwashing filters, delivering water over aerating towers, and transfer service. Most of the centrifugal pumps are single stage although a few two-stage pumps have been used.

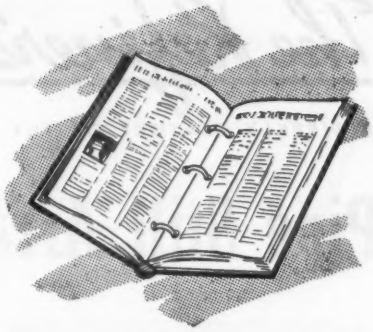
Cast-iron impellers in salt-water service last from 5 to 6 months; Navy bronze impellers have given service from 8 months to 3 years without replacement. Various plastics have been used on impellers but without outstanding success. Porcelain-lined centrifugal pumps have been in use as long as 3½ years without replacement while some pumps made of special alloy are estimated to last at least 5 years.

Reference

1. Simons, Harry F., "New Method of Applying Concrete—Saves Time and Material." The Oil and Gas Journal, January 21, 1943.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Pipe-Still Combustion Charts

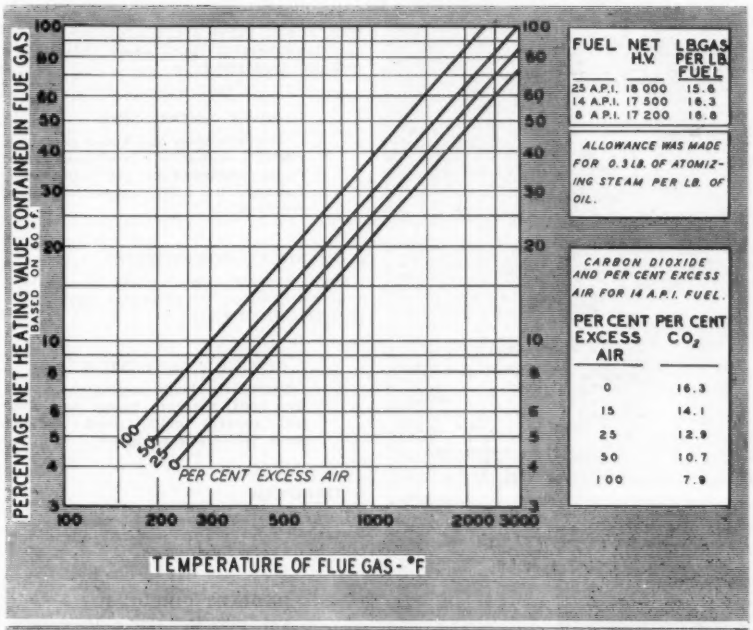
THE charts on this page permit the computation of heat balances for pipe stills and many boiler installations without the laborious computations normally required. Although only three fuels are shown, the charts may be used for any normal fuel oils ranging from 8° to 25° A.P.I. and for any of the gas compositions normally encountered in refineries. The gas chart (Fig. 2) should not be used for gases that are nearly pure methane, or pure ethane, etc. When using other fuels than the ones indicated on the charts, it is only necessary to bear in mind that the pounds of flue gas produced from each fuel is different. Values for pounds of flue gas per pound fuel (or cubic feet of flue gas per cubic foot of gaseous fuel) were tabulated in Tables 1 and 2 of Notebook No. 105 (August 10, 1946) for the special situation of no excess air (but assuming perfect combustion to carbon dioxide). Inasmuch as the pounds of flue gas is equal to the pound of fuel plus the pounds of air used in combustion, the pounds of flue gas when using any amount of excess air can be readily computed (Example 1). The charts may not only be used for stack temperatures (or percentage stack losses) but also any other point in the still where the temperature (or percentage of heat) of the gases is known (Example 2).

Example 1.—An 8° A.P.I. fuel oil produces 16.8 lb. of flue gas when using no excess air. If it is burned with 50 per cent excess air it will produce 24.7 lb. of flue gas:

$$(16.8 - 1)\,1.5 + 1 = 24.7$$

Example 2.—A gas-fired furnace using 50 per cent excess air is so arranged that 55 per cent of the net heating value of the fuel is absorbed in the radiant section and 1 per cent of loss through the radiant walls occurs. This leaves 44 per cent of heat in the flue gases and according to Fig. 2 the temperature of the gases will be about 1,300° F.

If the stack gas temperature is 700° F. the stack loss will be 20.5 per cent, and the convection section must be designed to absorb (or lose through walls) 44 minus 20.5 or 23.5 per cent of the heat in the fuel.


PERCENTAGE NET HEATING VALUE CONTAINED IN FLUE GAS BASED ON 60° F.
PER CENT EXCESS AIR
100
50
25
0
TEMPERATURE OF FLUE GAS - °F
FUEL | NET H.V. | LB. GAS PER LB. FUEL
25 A.P.I. | 18 000 | 15.6
14 A.P.I. | 17 500 | 16.3
8 A.P.I. | 17 200 | 16.8
ALLOWANCE WAS MADE FOR 0.3 LB. OF ATOMIZING STEAM PER LB. OF OIL.
CARBON DIOXIDE AND PER CENT EXCESS AIR FOR 14 A.P.I. FUEL.
PER CENT EXCESS AIR | PER CENT CO_2
0 | 16.3
15 | 14.1
25 | 12.9
50 | 10.7
100 | 7.9

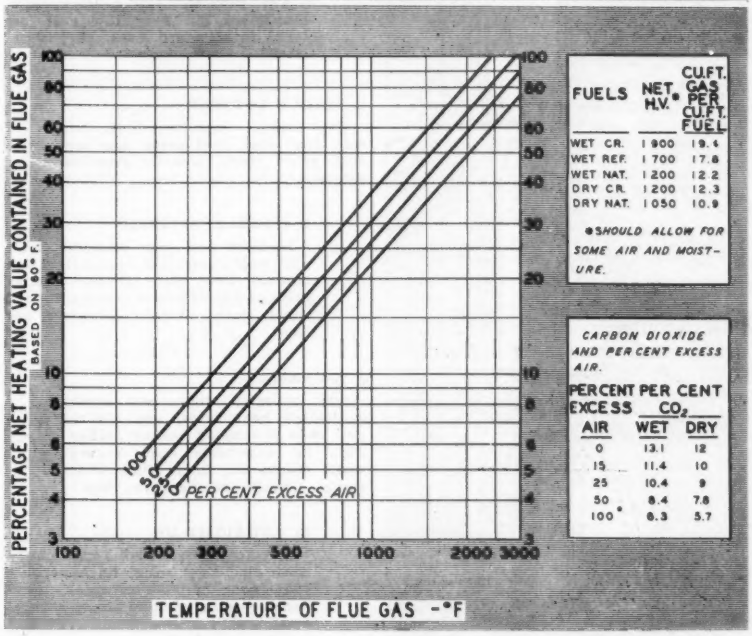

PERCENTAGE NET HEATING VALUE CONTAINED IN FLUE GAS BASED ON 60° F.
PER CENT EXCESS AIR
100
50
25
0
TEMPERATURE OF FLUE GAS - °F
FUELS | NET H.V. | CU. FT. GAS PER CU. FT. FUEL
WET CR. | 1 900 | 19.4
WET REF. | 1 700 | 17.8
WET NAT. | 1 200 | 12.2
DRY CR. | 1 200 | 12.3
DRY NAT. | 1 050 | 10.9
*SHOULD ALLOW FOR SOME AIR AND MOISTURE.
CARBON DIOXIDE AND PER CENT EXCESS AIR.
PER CENT EXCESS AIR | PER CENT CO_2 WET | DRY
0 | 13.1 | 12
15 | 11.4 | 10
25 | 10.4 | 9
50 | 8.4 | 7.8
100 | 6.3 | 5.7

Fig. 1—(Top) Combustion chart for fuel oils. Fig. 2—(Bottom) Chart for gaseous fuels

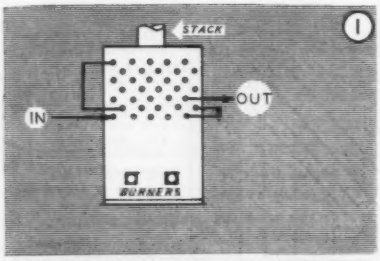
No. 107 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

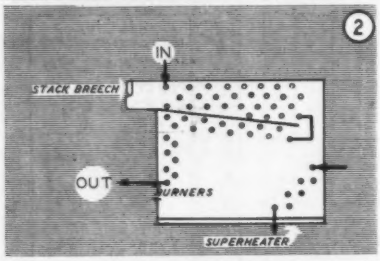
This page was originally printed in the August 3 issue, but the various pipe-still arrangements were mislabeled, due to transpositions of the paragraphs. It is here repeated, with the drawings properly captioned. Readers who are saving the pages of this feature should substitute this corrected version for the original page.

Pipe Still Arrangements



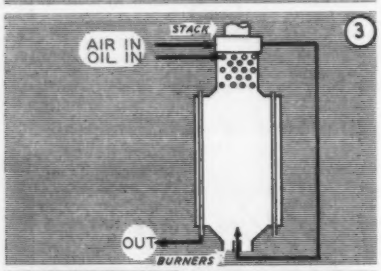
1. CONVECTION

Very small capacity, poor heat rate, lowest tubes overheated, simple, inexpensive, short stack, historically important.



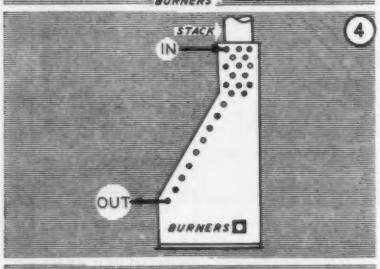
2. OVERHEAD CONVECTION

Small capacity, short tubes, poor heat distribution, troublesome roof partition, short stack.



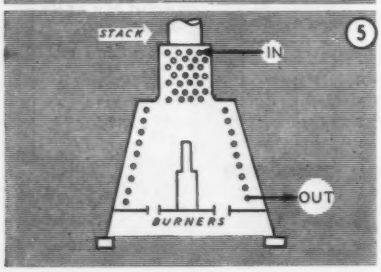
3. CIRCULAR

Large capacity, expensive, tall superstructure, excellent radiant distribution, very short stack.



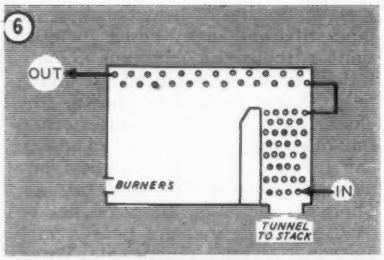
4. SINGLE UPFIRED

Very small capacity, high but well regulated heat rates, medium cost, short stack. Usually requires gas fuel.



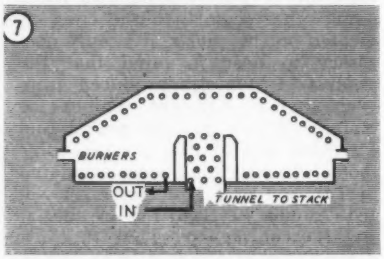
5. A-FRAME

Any capacity, high and easily controlled heat rates, can control two coils if employ center bridgewall, no expensive roof, several small stacks on long stills, short stacks. Usually requires gas fuel.



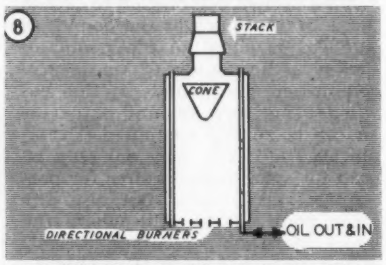
6. DOWN CONVECTION

Most common but being replaced, medium capacity, low heat rate, flame impingement at bridgewall, standard for many years, tall stack required.



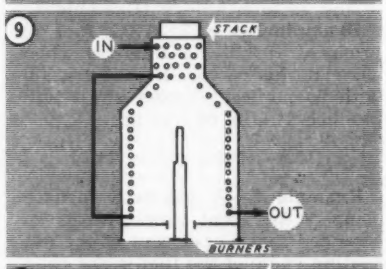
7. CENTER CONVECTION

Extremely large capacity, expensive roof, medium tubes, can control several coils, good radiant rates, tall stack required.



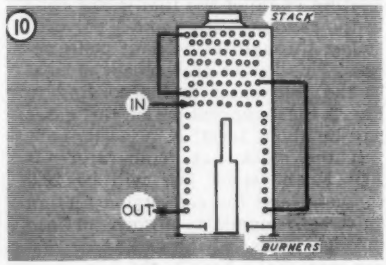
8. RADIANT CIRCULAR

Any capacity, low uniform rate, inefficient but very low cost, offered in standard sizes, very short stack.



9. DOUBLE UPFIRED

Medium and large capacity, high and well controlled heat rates, can control two coils if use center bridgewall, efficient, medium cost, short stack. Usually requires gas fuel.



10. STRAIGHT UP

Any capacity, high and easily controlled heat rates, no expensive roof, poor convection rates, inexpensive, simple, short stack, several small stacks on large stills. Usually requires gas fuel.

No. 104 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

Engineering Fundamentals

No. 249

A FEATURE OF THE OIL AND GAS JOURNAL

Uses of Contour Maps

This installment concludes the instructive treatment and illustrative information on "Surveying" as applied to construction problems of the oil and gas industries, which has been running on this page since May 4. Next week Dr. Stephenson takes up a new petroleum engineering subject.

CONTOUR maps are used in many different ways by engineers. Such maps when drawn to a small scale are used frequently to determine the preliminary location of railroads, highways, power lines, and pipe lines. Exact surveys will need to be run later along the preliminary location before actual plans can be drawn, but contour maps save much time which otherwise would be spent in making preliminary surveys. Profile and cross sections are also frequently taken from contour maps. Such maps are particularly useful in the solution of grading problems and in the determination of earthwork quantities.

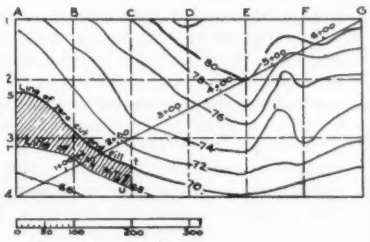
Fig. 1 is a contour map drawn from the data shown in Fig. 2 of the previous article. Originally the map was drawn to a horizontal scale of 1 in. = 80 ft. with a contour interval of 2 ft. Suppose a profile of the ground line is desired along a line connecting point A-4 with point G-1. A line is drawn on the map connecting the two points. Each full station is marked off on the line and numbered. A tabulation is next made of the station number and the elevation of the points of intersection with the contour lines. Such a tabulation is:

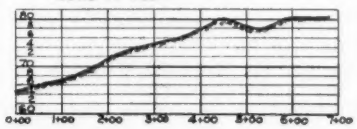
Station	Elevation
0 + 00′	64.7
0 + 54′	66
1 + 26′	68
1 + 69′	70
2 + 08′	72
2 + 64′	74
3 + 52′	76
4 + 00′	78
4 + 40′	80
5 + 14′	78
5 + 42′	78
5 + 84′	80
6 + 72′	80.6

From the data as tabulated, the profile shown in Fig. 2 was drawn.

Earthwork Quantities

Quantities of earthwork can also be computed from contour maps. Suppose the area bounded by A-1, C-1, C-4 and A-4, of Fig. 1 is to be leveled off to elevation 70. This will require both cut and fill. The contour line at elevation 70 will represent the line of transition between cut and fill and as such it is called the line of zero cut and fill. All along the contour line of elevation 72 ft. the cut will be 2 ft. while along the contour line of elevation 68 ft. the fill will be 2 ft. If a planimeter were to be run around the area rstu as shaded in Fig. 1, the area in square feet falling between the line of zero fill and the line of 2-ft. fill could be determined. If the area is then multiplied by the average depth of fill, in this case 1 ft., the volume of fill to be placed in that area could be computed. This same procedure could be followed for all similar fill areas. The sum of the products in fills will be the total volume of fill required; likewise the sum of the products in cuts will be the total volume of cut necessary. This example illustrates the most elementary type of problems of this kind.





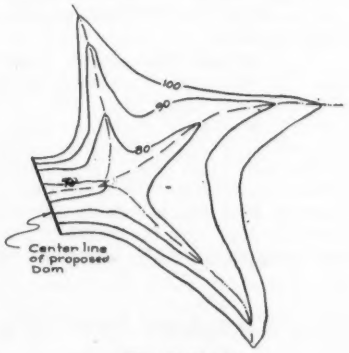


Fig. 1—Top
Fig. 2—Center
Fig. 3—Bottom

Usually the finished surface is not a level surface as in the illustration just given. In fact the finished surface is usually not a plane surface although in any case it is represented by contour lines. These contour lines are commonly dashed or dotted to distinguish them from the contour lines that represent the existing ground surface. At the points of intersection of the contour lines representing the finished surface with the contour lines representing the present ground surface the magnitude of the cut or fill can be determined. Free-hand lines are then drawn on the map connecting all points of equal cut and equal fill. These lines are drawn similar to contour lines and are referred to as "equal-depth contours." The area falling between any two adjacent equal depth contours is then measured with a planimeter and earthwork quantities computed as explained in the paragraph above.

Storage capacities of proposed reservoirs can also be found from contour maps. Fig. 3 is typical of such a case. This shows the center-line of a proposed dam which is to be built with its spillway at elevation 100. By planimetering the areas inclosed by the contours from 70 to 100 the storage capacity in acre-feet can be ascertained. For example, if the area inclosed by the eightieth contour is 10.0 acres and that by the ninetieth contour is 26.8 acres, the storage capacity between the two contours is $\frac{1}{2} \times (10.0 + 26.8) \times 10 = 184$ acre-feet where an acre-foot is one acre of ground covered by water to a depth of one foot.

Contour lines cross ridge lines at right angles. Hence the drainage area that contributes run off to a water shed or reservoir can be determined from any reasonably accurate contour map by sketching on the map a free-hand line which represents the ridge line of the area. Such a ridge marks the limits of the water shed. The drainage area that is encompassed can be determined by a planimeter, or if the area is large, by counting the number of sections or townships which fall within the limits of the basin.

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, and Prof. D. Don Haines, department of civil engineering, University of Kansas

LEADING CONTRACTORS PREFER
Sterling
PUMPS • HOISTS • LIGHT PLANTS
DEPENDABLE
RUGGED
SIMPLE
•
SAVE
MONEY
SAVE
TIME
EASY
TO
OPERATE
•
WRITE
FOR
CATALOG
STERLING QUALITY
STERLING
MACHINERY CORPORATION
4015-17 SOUTHWEST BLVD. KANSAS CITY 10, MO.

OIL and GAS
BURNING EQUIPMENT
NATIONAL
AIROIL
BURNERS
1236 E. Sedgley Ave.
PHILADELPHIA 34, PENNA.

Announcing:
A NEW SERVICE
To Producers of Natural Gas, Gasoline & Oil
SERVICES OFFERED:
Gas testing by Compression or Charcoal, for Settlement or General Field Survey work — Gas/Oil Ratios — Gas Analyses.
E. W. SAYBOLT & CO.
Inspectors of Petroleum
General Headquarters NEW YORK CITY
All inquiries to PONCA CITY, OKLAHOMA Box 53, Phone 98

REFINING

Institute Says Standards Call for "Stable Distillate"

CHICAGO. — The recently-announced fuel-oil specifications of the oil division of the Institute of Cooking and Heating Appliance Manufac- of gravity, flash, viscosity, corrosion, pour, carbon residue, and other factors "entering into the composition of an oil that will produce maximum heat at a minimum cost and with a minimum of service necessary for the equipment." The institute added the recommendations of the committee were unanimously approved by the industry.

The institute's specifications have met some opposition in the refining industry. It was said such requirements would tend to eliminate use of catalytically cracked fuel, since the institute called for an A.P.I. gravity of 36° minimum at 60° F. and a kinematic viscosity at 77° F. of 2.3° minimum and 2.9° maximum.

In the same announcement, the institute predicted the production of burners will soon reach a rate to meet demand estimated at 1,000,000 burners a year for the next 5 years. A total of 38,690,000 bbl. of oil annually is required for the 2,500,000 vaporizing burners now in operation. The industry's goal for the first full year after reconversion is 750,000 burners which would require an additional 11,625,000 bbl. of fuel oil, making the total 50,315,000 bbl. annually for the 3,250,000 units.

turers were designed "to assist oil refiners in producing fuel oil that will give uniformly satisfactory burning qualities in all types of vaporizing burners."

In a recent release, the institute said its standards were developed by its technical committee after a long period of closely observed tests in laboratories of manufacturers and independent testing organizations. These standards, the institute continued, call for a "stable distillate" produced by any oil refining process in accordance with specified limits

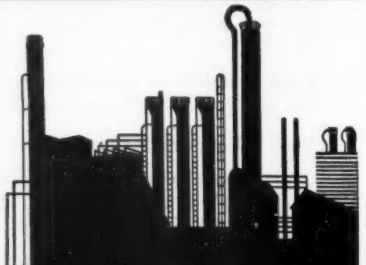
Gulf Completes New Units At Philadelphia Refinery

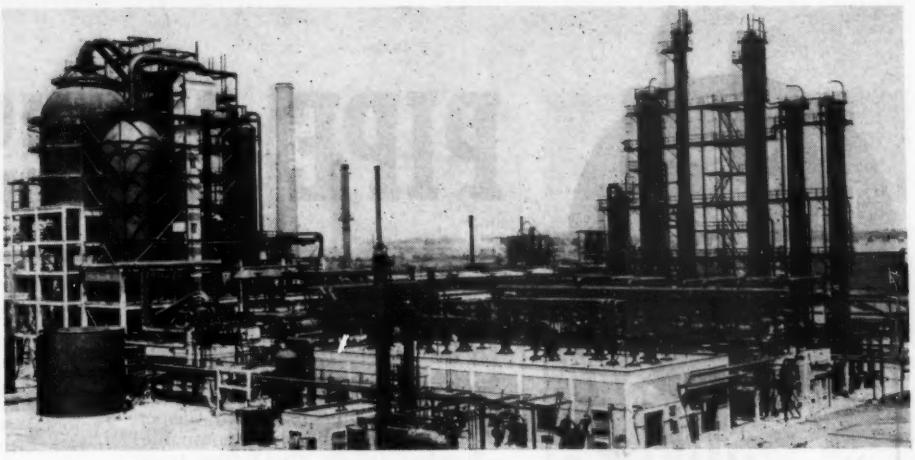
PHILADELPHIA, Pa.—Completion and placing in production of new refinery units at Girard Point near here was announced last week by Gulf Oil Corp.

The new units, in effect, increase the capacity of the Philadelphia refinery by 30,000 bbl. of crude daily and add substantially to the gasoline manufacturing facilities of the eastern United States. Efficiency of gasoline production is improved by use of the fluid catalytic process.

The expansion is built around a fluid catalytic cracking unit, one of the largest ever constructed, covering more than 100,000 sq. ft. and 220 ft. tall, the company announced. Through the new unit is passing a boxcar load of catalyst every 2 minutes during operation, and a minimum of 75,000 bbl. of crude must be charged into

McNamar
Steel Plate
Fabricators and
Contractors
•
Products Storage
•
Pressure Vessels
•
Domestic and Industrial
Gas Equipment
•
McNAMAR
BOILER & TANK CO.
Box 868 -:- Tulsa, Okla.


We design and construct all types of modern refining units.
★ Serving the Industry Since 1915
BORN ENGINEERING CO.
Tulsa, Oklahoma



The latest design of fluid catalytic cracking unit went into operation recently at Gulf Refining Co.'s Philadelphia plant. New principles include improved arrangements of reactor and regenerator which reduces the unit's over-all height by almost 40 ft. Cracking takes place in the structures to left. Towers to the right are the gas-recovery system where gases produced in the cracking process are separated

the refinery daily for capacity operation.

Other refinery facilities have been expanded to keep pace with the new production potential. New atmospheric and vacuum topping stills were erected to handle the additional 30,000 bbl. a day. Additional cooling towers provide the necessary condenser waters.

Gas-separation facilities were erected to divide the petroleum gases produced into those suitable for use as refinery fuel and those for manufacture into gasoline. The latter are processed in a new alkylation unit.

New tank fields, pipe lines, pumping facilities, and auxiliary equipment for the necessary additional steam, compressed air, fuel, water, and refrigeration, were installed. M. W. Kellogg Co., and The Lummus Co. were engineers and constructors for the project.

Construction began during the war for the production of aviation fuels and the plant is now converted to nonmilitary, peacetime operations.

The fluid catalytic cracking process permits the distillation of 45 bbl. of high-test gasoline from 100 bbl. of crude, Gulf's announcement said.

Nebraska Refineries Ask In-Transit Privileges

OMAHA, Neb.—Because of increasing competition from pipe lines, in-transit privileges on crude shipped from southwestern states is being sought by refineries in Nebraska.

A request has been filed with the Western Trunk Line Committee by transportation and refining interests at Omaha for the in-transit rate by which crude would be refined at Omaha and moved to destinations beyond with through rates applying on the refined product from point of origin of the crude to destination of the refined product. An additional small charge would be made for the transit privilege.

In support of the request, it was pointed out by the transportation department of the Omaha Chamber of Commerce that similar transit privileges have been granted on many other commodities.

This Baby is TOUGH!

Airetool Tube Cleaners Crack-Down on Coke—

Airetool tube cleaners and expanders have the "guts" of champions . . . they take it on the chin and keep boring in . . . they don't stop!

Airetool engineers know that there is no place for a tool that must be pampered. They know that in the refinery industry, or in any other highly competitive field, it's results that count, it's the ability to take rough and tumble handling and come up with a precision job that pays off.

So Airetool cleaners and expanders are TOUGH BABIES . . . yet they retain split hair precision. Airetool Cleaners keep tubes at a high efficiency level and Airetool Expanders roll out joints in a smooth perfection that resists the high temperatures and pressures necessary to modern refinery operation.

There is an Airetool Cleaner and Expander for every job you have. Cleaners with either the cutter or brush head types are available for curved or straight tubes in sizes from ½" to 24" I.D. Airetool expanders are particularly adapted to heavy wall tube rolling common to the refining industry.

Write Airetool Manufacturing Co., Dept. OG, Springfield, Ohio, for further information and informative booklets and catalogs.

AIRETOOL MANUFACTURING COMPANY

Springfield, Ohio

WHEN YOU WANT The Best IN PIPELINE CONSTRUCTION

OKLAHOMA CONTRACTING COMPANY

DALLAS TEXAS

SOUTH AMERICA
APARTADO 1085
CARACAS, VENEZUELA

PIPE LINES

Denver-Casper Line Due To Be Started This Fall

DENVER.—Construction of a 300-mile gasoline pipe line from Casper, Wyo., to Denver by three companies —Standard Oil Co. (Ind.), The Texas Co., and Socony-Vacuum Oil Co., Inc. —will get under way before the middle of October, according to reports current here last week.

The line is scheduled for completion by next spring. Total cost of the project is estimated at more than $3,600,000, it was said. Reported plans call for a line of 8-in. diameter.

Refineries in Casper are operated by Indiana Standard, 13,000-bbl. daily capacity; The Texas Co., 7,000 bbl. daily capacity, and Socony-Vacuum, 5,000 bbl. daily capacity. The three companies including General Petroleum Co. of California which is controlled by Socony-Vacuum, are major marketers in the Denver area and at present haul their products into the area by tank car or truck.

Some Pipe Delivered for El Paso Natural's Gas Line

Some of the pipe has been delivered to El Paso Natural Gas Co. for the 26-in. natural-gas pipe line to be built from West Texas to California. Digging of rock ditches is going on at certain points.

Construction plans are reported to provide for having the pipe laid for four spreads, three of which will be those of the El Paso Natural organization. The fourth spread will be that of Midwestern Constructors which has contracted the section from Tucson, Ariz., to Blythe, Calif. All four spreads are to use the pressure-welding method.

Humble Reconditioning Lines in Groesbeck Area

In the Groesbeck, Tex., area, Humble Pipe Line Co. is undertaking the reconditioning of 25 miles of 8-in. crude line and the same length and diameter of butane line. Latex Construction Co., the project contractor, has nearly completed work on the butane line which continued in service during reconditioning. After repairing the pipe, it is double coated with coal-tar enamel and double wrapped with one wrap of glass and one of felt.

The Latex organization has recently completed a take-up and lay job for Humble which was unusual because it required 10 trips along an 8-mile right-of-way in a highly developed residential section of Houston at River Oaks, Post Oaks, and Memorial Drive where the project entailed taking up six 8-in. and laying two new 8-in. and two new 12-in. crude-oil lines. During May and June there was 25 in. of rainfall in the area. The job started in April and was completed August 1.

Southern Natural Starts Gwinville-Pickens Line

In preparing for the 80 miles of 16-in. to be built by Southern Natural Gas Co. from Gwinville to Pickens, Miss., the contractor, Latex Construction Co., is moving in equipment and clearing right-of-way.

Pipe is expected to arrive the first week in September, and the project

SPEED • SATISFACTION SERVICE

DOING A BETTER PIPE LINE JOB!

Better prepared to undertake any job in pipe line construction. Complete, modern equipment, experienced personnel, and a personal pride in giving you complete, satisfactory service in the shortest possible time—that's why we're doing a better pipe line job! When you plan your next pipe line, give us a call.

VAUGHN-TAYLOR CONSTRUCTION CO.
Builders of Better Pipe Lines
318 HAMILTON BLDG BOX 1331 PHONE 2-1821
WICHITA FALLS • TEXAS

ANDERSON BROTHERS
Pipe Line Contractors and Engineers
707 NORTH DRENNAN
HOUSTON, TEXAS

. . . . . with MODERN, EFFICIENT EQUIPMENT . . . AND PLENTY OF IT!

above all EXPERIENCE

Not just Contractors but PIPE LINE SPECIALISTS

is due to be completed early in December. The contractor's operations will be supervised by R. P. Gregory, general superintendent, and Earl Norris and W. H. Hays, spread superintendents for the two crews which will be laying the line.

FCC Permits Radio Use; Aid to Air Patrols Seen

WASHINGTON.—The Federal Communications Commission this week authorized radio communication service for public utilities. The use of two-way radio will permit the concerns to issue orders and instructions to moving vehicles, and to speed trouble calls and repair crews. Under the FCC order, pipe-line systems, electricity, gas, water, and steam companies, and local transportation companies will be permitted to use radiotelephony in their operations after September 9.

The use of radio is expected to be particularly useful to the oil industry in the air patrol of pipe lines. At present a patrolman must either drop a message at a pump station or land at the nearest airfield and make a report by telephone if he discovers a leak. The time consumed in this operation often results in the loss of large quantities of oil. With radio installations, however, the patrolman will be able to report any findings immediately to the nearest ground station.

Another disadvantage in air patrol which radio will overcome is the tracing of the progress of the patrol plane. When a plane departs from an airport, messages go out over pipe-line company wires stating the estimated time of arrival of the plane over each pump station and warning the operators of the stations to be on the lookout. If, during the flight between two particular stations, the plane develops engine trouble and is forced to leave the line, there is no method of notifying the operator of the next scheduled station and he assumes the plane has been forced down when it does not arrive within a given time.

T.G.&T. Preparing To Let Contracts

Tennessee Gas & Transmission Co.'s program provides for letting contracts in August, September, and October for the laying of various sections of loops totaling 495 miles, including 400 miles of 26-in. and 95 miles of 16-in. Specifications have been issued for much of this work.

In addition, 25 miles of 10-in. and 12-in. gathering lines will be laid. These projects are part of an expansion program approved by the Federal Power Commission which also includes addition of 19,600 hp. of angle compressors. These will be furnished by Cooper-Bessemer, and Worthington and Clark. These will be installed at nine stations; the work will be done by the company's crews.

Construction work is to start this fall on three new stations to be equipped with a total of 24,000 hp. of Cooper-Bessemer horizontal compressor units. These new stations are to be located as follows: No. 1, Victoria, Tex.; No. 3, Cleveland, Tex.; and No. 5, Natchitoches, La.

When the expansion program is completed in the fall of 1947, the company will have facilities for increasing daily sales of gas from the present capacity of 264,000,000 cu. ft. to 381,000,000 cu. ft.

Stanolind Lays Gathering Lines Near Alvin, Tex.

Stanolind Oil & Gas Co. is laying 75 miles of gathering system in diameters varying from 2-in. to 16-in. from its pressure-maintenance operations near Alvin, Tex.

Work has been contracted by Associated Constructors and Engineers. This firm has recently completed 17 miles of 4-in., 5-in., and 6-in. natural-gas lines for Magnolia interests near Jennings, La.

DEPENDABLE PROTECTION

with Reilly PIPE ENAMEL

Reilly COAL TAR PRODUCTS

17 PLANTS To Serve The NATION

REILLY TAR & CHEMICAL CORPORATION

Merchants Bank Bldg., Indianapolis
500 Fifth Ave., New York • 2513 S. Damen Ave., Chicago

CRC

PIPE LINE CONSTRUCTION EQUIPMENT

CRUTCHER-ROLFS-CUMMINGS
Pipe Line Equipment and Materials
Houston-Tulsa

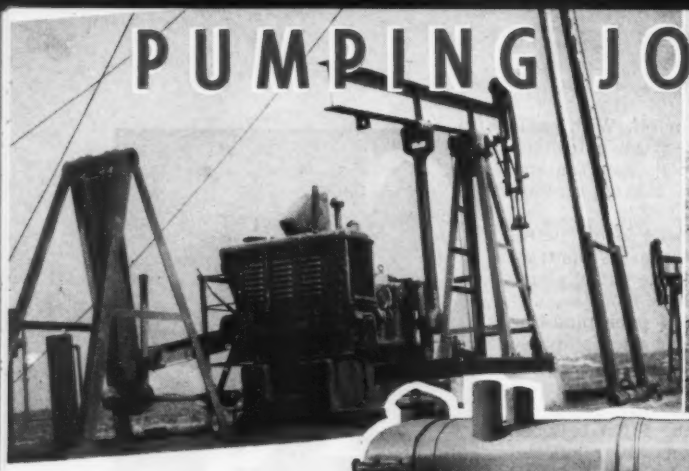
MOLE
Pipeline
Cleaner

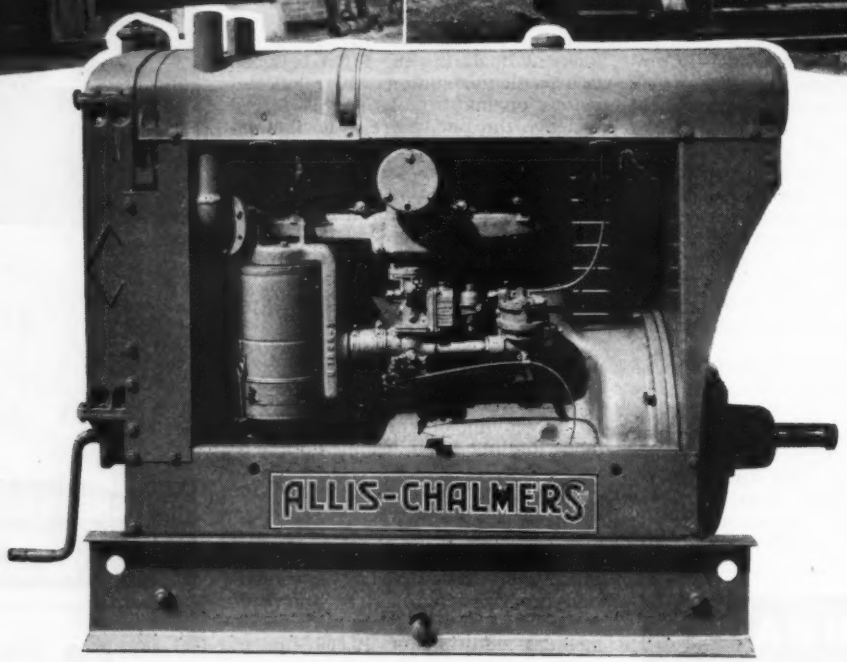
For BETTER cleaning of
CRUDE LINES
PRODUCT LINES
NATURAL GAS LINES

FOR DETAILS WRITE

Pipeline Cleaners Co.
Fort Madison, Iowa

PUMPING JOBS are easy



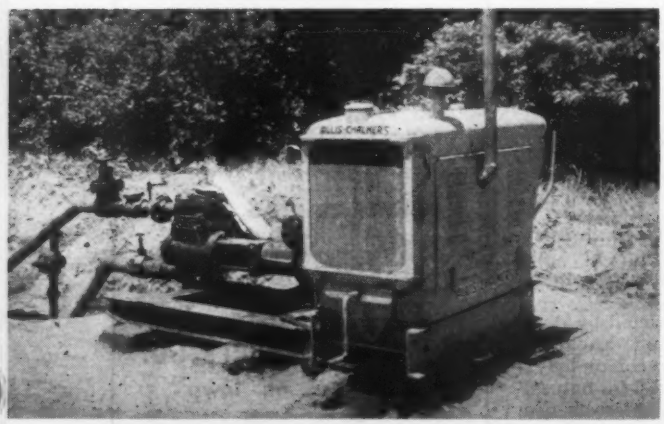


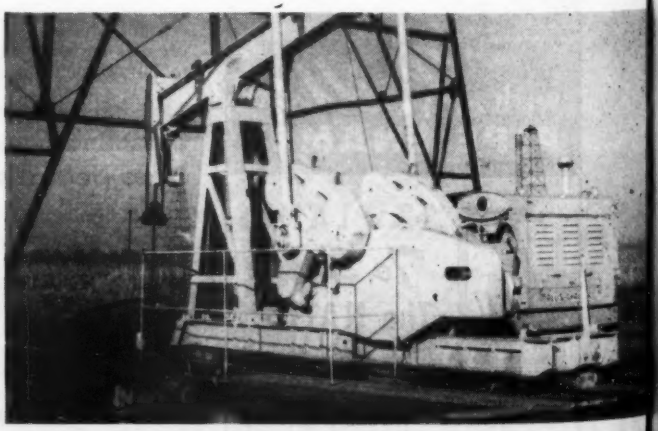
with A-C Model U ENGINES

Applicable to a multitude of oil industry prime mover requirements, the Allis-Chalmers Model U Engine is low in cost for its power output of 200 ft. lbs. torque.

This engine, as are all A-C engines, is tractor type, slow speed, designed and constructed for full load and straight time work.

It is sold as a complete Power Engine Unit ready for installation. May we submit specifications and prices?





FRED E. Cooper

Hale Station, TULSA, OKLAHOMA

NATURAL GAS

New Field Adds to Gas West Virginia Reserves

CLARKSBURG, W. Va.—Hope Natural Gas Co.'s $5,000,000 expansion program, announced early this spring, is under way and the drilling program included has already augmented West Virginia's supply of natural gas, according to John A. Clark, general superintendent.

Clark said that 20 new gas wells had been completed in the new Wyoming County gas field over the past 12 months and the company expects to drill as many over the next 12-month period.

A number of wells in the new field, which extends into Raleigh and Fayette counties, have been drilled by United Carbon Co., of Charleston, and the Godfrey L. Cabot Co.

Clark said his company expects to complete installation, by November 1, of pipe lines and compressor facilities in the Wyoming County field. He said work is progressing on a modernization program at the two Hastings plants, at a cost of $1,600,000.

Michigan Gas Storage Application Denied

WASHINGTON. — An application filed by Michigan Gas Storage Co., Jackson, Mich., for permission to purchase natural gas under a temporary emergency certificate from Panhandle Eastern Pipe Line Co. at Zilwaukee Junction, near Saginaw, Mich., and to sell the gas to Consumers Power Co., was denied last week by the Federal Power Commission.

The company had planned to utilize the Winterfield and Cranberry Lake gas fields as possible storage units, but the commission stated it would not be appropriate to issue the certificate until a final determination is made of the most desirable and economic means of utilizing these fields.

Cabot Raises Channel Black Prices ½ Cent

BOSTON.—Following the removal August 2 of price control by Office of Price Administration on carbon black, a price increase of ½ cent per pound on all grades of ordinary carbon black made by the channel-process was announced by Godfrey L. Cabot, Inc.

The increases are based on carload prices, the company said, and follow a rise in the price of natural gas approved by OPA last June. There will be no change in the company's prices for furnace-process black.

Gas Sales Curb Lifted

WASHINGTON.—The Federal Power Commission last week removed limitations on the sale of natural gas in western New York and northern Pennsylvania by New York State Natural Gas Corp., Hope Natural Gas Co., United Fuel Gas Co., Manufacturers Light & Heat Co., and the Home Gas Co. The restrictions were placed on the companies in 1944, limiting the number of customers and amounts of gas that could be delivered.

Natural Gasoline

Hypersorption Process Described at Meeting

LOS ANGELES.—The hypersorption process for recovery of light hydrocarbons which could not be economically accomplished by conventional operations was described to California natural-gasoline manufacturers last week by W. S. Clyde Berg, Union Oil Co. of California.

The process, Dr. Berg explained to plant operators assembled for the regular monthly meeting of the California Natural Gasoline Association, involves contacting the feed-gas stream in an adsorption zone with a moving bed of activated carbon which has been previously stripped and cooled. Constituents whose recovery is not desired are separated from the moving bed in a rectification zone. The desirable hydrocarbons are recovered in steaming and stripping zones as a vapor, and the products condensed for ultimate blending, further processing, or for use in their pure stage. The stripped activated carbon is gas lifted to the top of the column, and the cycle of operation repeated.

The hypersorption process, Dr. Berg asserted, provides a new tool for chemical engineers in their approach to recovery and separation of extremely volatile or low-concentration gases. Applications have ranged from the purification of hydrogen to the recovery of natural gasoline, and the recovery of volatile chemicals and solvents has been considered.

Advantage of the process over conventional oil absorption, he explained, is due in part to the ability of activated carbon to retain relatively large quantities of volatile hydrocarbons at low pressure. For example, he stated, at approximately 10 psi., 1 lb. of activated carbon will retain 25.2 times as much methane, 13.2 times as much ethane, and 5.5 times as much propane as 1 lb. of an absorption oil having a molecular weight of 200. A second advantage of the process is the selectivity exhibited by activated carbon in its adsorbent action and the technique developed for controlling this selective action.

C.N.G.A.'s next meeting will be held at the Rio Hondo Club September 3. Jan G. Schaafsma, General Petroleum Corp., and a member of the strategic bombing survey mission, will discuss Japan's oil industry and its influence upon U. S. bombing operations. The second feature for September will be a discussion by Paul Paules, International Cementers, on "The Chemical Cleaning of Gasoline Plant and Refinery Equipment."

Light Products Output Rises Slightly in May

WASHINGTON. — Daily average production of natural gasoline and allied products increased slightly in May, according to the Bureau of Mines' monthly report. Daily average for the month was 12,708,000 gal., compared with 12,702,000 gal. in April. The total was 3.4 per cent under the 13,151,000 gal. produced in May 1945.

An increase in Texas' total production of 3.3 per cent to 182,381,000 gal. in May, a general rise throughout all areas of the state with the exception of the Panhandle, was nearly offset by decreases in the Appalachian district and the Louisiana Gulf Coast. Stocks at refineries, plants and terminals at the end of the month of 294,181,000 gal. were the highest since September 1940. Demand rose 4.8 per cent in May to 404,748,000 gal. at plants.

LPG Group Opens Office

A state office has been opened by the Kansas Liquefied Petroleum Gas Association in the Kaufman Building in Wichita. R. H. Mahnke, association executive vice president, is in charge of the Wichita office.

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 17, 1946

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	30	15	0	*15	40,360	985	891	0	0	0	0	0	0	0	0	0	0
Pennsylvania	76	41	6	†29	117,257	2,487	2,567	0	0	0	0	0	0	0	0	0	0
West Virginia	13	2	7	4	32,755	442	502	0	0	0	0	0	0	0	0	0	0
Ohio	27	8	5	14	68,824	749	578	0	0	1	1	2	2	0	11	24	37
Indiana	6	4	0	2	12,549	222	121	0	0	0	0	0	2	0	0	11	13
Kentucky	7	4	0	3	15,134	304	315	1	0	0	3	4	3	0	0	26	29
Illinois	44	27	0	17	116,955	1,368	1,088	1	0	0	12	13	27	0	0	257	284
Michigan	21	5	5	11	36,191	502	471	0	0	0	3	3	17	0	5	163	185
Kansas	39	19	2	‡18	129,152	1,227	1,049	2	0	0	8	10	19	0	1	160	180
Neb., Mo., Iowa	0	0	0	0	0	12	13	0	0	0	0	0	0	0	0	8	8
Oklahoma	52	37	3	12	177,890	1,620	1,516	0	0	1	6	7	52	0	28	196	276
Texas	134	84	11	39	668,143	4,981	4,528	4	0	2	22	28	122	21	20	794	957
North Central	35	14	0	21	105,670	1,801	1,363	1	0	0	7	8	36	0	2	328	366
West	31	28	0	3	160,129	1,062	1,154	0	0	0	2	2	30	0	1	107	138
Panhandle	4	3	1	0	11,364	208	357	0	0	0	0	0	0	0	0	5	5
Eastern	18	10	6	2	107,740	448	201	0	0	1	1	2	10	0	2	56	68
Gulf Coast	34	25	2	7	238,357	1,089	1,026	2	0	0	7	9	30	19	7	159	215
Southwest	12	4	2	6	44,883	373	427	1	0	1	5	7	16	2	8	139	165
Louisiana	23	12	5	6	99,798	825	642	1	0	0	2	3	37	6	6	109	158
Northern	17	10	4	3	59,349	457	236	0	0	0	1	1	8	0	1	60	69
Southern	6	2	1	3	40,449	368	406	1	0	0	1	2	29	6	5	49	89
Arkansas	1	1	0	0	2,462	110	110	0	0	0	0	0	5	0	0	25	30
Mississippi	4	4	0	0	41,625	153	229	0	0	0	0	0	1	0	1	41	43
Southeastern States	0	0	0	0	0	27	39	0	0	0	0	0	1	0	0	22	23
Montana	4	2	0	2	9,514	189	194	0	0	0	0	0	9	0	1	22	32
Wyoming	5	3	0	2	13,729	106	126	0	0	0	1	1	10	0	3	27	40
Colorado-Utah	4	4	0	0	25,786	89	22	0	0	0	0	0	4	0	0	11	15
New Mexico	10	8	0	2	36,801	229	277	0	0	0	1	1	3	0	0	25	28
California	11	9	0	2	71,613	1,087	1,488	0	0	0	2	2	7	0	3	139	149
Total United States	511	289	44	178	1,716,538	17,714	16,766	9	0	4	61	74	321	27	79	2,060	2,487
Total previous week	547	299	50	198	1,900,291	17,203	16,252	14	2	5	68	89	312	27	75	1,999	2,413
Total Aug. 18, 1945	514	267	48	199	1,758,574			4	0	3	53	60	323	17	88	2,149	2,577

Service wells included: *15, †29, ‡1.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$1.17	....	....	....
19-19.9	1.21	....	$1.41	$1.05
20-20.9	1.24	$1.20	1.43	1.07
21-21.9	1.28	1.22	1.45	1.09
22-22.9	1.32	1.24	1.47	1.11
23-23.9	1.35	1.26	1.49	1.13
24-24.9	1.39	1.28	1.51	1.15
25-25.9	1.43	1.30	1.53	1.17
26-26.9	1.46	1.32	1.55	1.19
27-27.9	1.50	1.34	1.57	1.21
28-28.9	1.54	1.36	1.59	1.23
29-29.9	1.57	1.38	1.61	1.25
30-30.9	1.61	1.40	1.63	1.27
31-31.9	....	1.42	1.65	1.29
32-32.9	....	1.44	1.67	1.31
33-33.9	....	1.46	1.69	1.33
34-34.9	....	1.48	1.71	1.35
35-35.9	....	1.50	1.73	1.37
36-36.9	....	1.52	1.75	1.39
37-37.9	....	1.54	1.77	1.41
38-38.9	....	1.56	1.79	1.43
39-39.9	....	1.58	1.81	1.45
40 and above	....	1.60	1.83	1.47

*Includes Lea County, New Mexico.

(Quotations shown here are f.o.b. plant in tank cars and in cents per gal. as of last Monday. Crude prices reflect latest 25-cent advance except in California and Pennsylvania where no increase had been made as of Monday morning, July 29.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-78½†	73-75
Mid-Continent*	7.500-7.750	6.750-7.000
Tex. Gulf Coast	7.250	6.500-6.750
New York Harbor	8.750-9.500	7.750-8.500
California		7.000-7.875

*Basic Oklahoma Group 3. †1939 C.F. R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	4.500	5.400
N. Texas (f.o.b. plant)	4.000	4.800
N. Louisiana (f.o.b. plant)	4.250	5.100
California (averages)	5.500	6.250

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.60
Kettleman Hills, California*	1.69
Beauregard Parish	1.55
Illinois Basin	1.72
Pecos County, Texas	1.30
Bradford, Pennsylvania	3.35
Eastern Ill., and Western Ind.	1.57

Note: Exclusive of subsidy.
*For 37-37.9 gravity.

A.P.I. REFINERY REPORT

Week ended August 10, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks Gasoline	Stocks Distillate	Stocks Residual
East Coast	734	22,326	15,478	9,908
Appalachian	159	3,103	546	405
Ill., Ind., Ky.	770	16,088	7,065	4,696
Okla., Kan., Mo.	382	7,696	3,056	1,406
Inland Texas	233	2,632	508	819
Tex. Gulf Cst.	1,193	13,484	7,314	5,474
La. Gulf Cst.	348	4,002	2,826	1,669
N. La., Ark.	59	1,707	461	162
Rocky Mtn.	132	1,519	499	829
California	796	14,459	10,277	26,245
Total 8-10-46	4,806	87,016	48,030	51,613
Total 8- 3-46	4,849	*86,741	45,670	50,138
Total 8-11-45	5,036	86,414	36,969	43,360

*Revised by Bureau of Mines.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
August 10, 1946	224,098,000
August 3, 1946	224,832,000
August 11, 1945	214,098,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Aug. 17 crude oil	B. of M. Aug. demand	Aug. 10 crude oil
Alabama	1,150	2,000	1,100
Arkansas	79,750	78,000	78,950
California	885,600	850,000	876,150
Colorado	43,400	30,000	33,520
Eastern	64,500	64,000	66,500
Florida	200	200	150
Illinois	204,050	215,000	210,200
Indiana	17,450	19,000	17,700
Kansas	277,450	260,000	260,950
Kentucky	30,500	31,000	31,000
Louisiana	395,600	380,000	394,850
North Louisiana	91,800	.....	91,050
South Louisiana	303,800	.....	303,800
Michigan	47,038	47,000	45,800
Mississippi	71,450	60,000	68,600
Montana	25,040	24,000	25,100
Nebraska	750	800	750
New Mexico	100,850	99,000	100,850
Oklahoma	383,550	384,000	382,500
Texas	2,119,800	2,120,000	2,119,800
District 1 (Southwest)	19,500	.....	19,500
District 2 (Southwest)	155,100	.....	155,100
District 4 (Southwest)	224,300	.....	224,300
District 3 (Gulf Coast)	486,550	.....	486,550
District 5 (Eastern)	43,050	.....	43,050
District 6 (Eastern)	105,650	.....	105,650
East Texas Field	317,000	.....	317,000
District 7C (West)	27,900	.....	27,900
District 8 (West)	490,600	.....	490,600
District 7B (W. Central)	32,650	.....	32,650
District 8 (N. Central)	132,700	.....	132,700
District 10 (Panhandle)	84,800	.....	84,800
Wyoming	111,990	110,000	109,250
Total United States	*4,860,118	4,774,000	4,823,720
Change from prev. wk., up	36,398		

Total production January 1-August 17 ..... †1,082,748,125 bbl.
Same period last year (crude, plus condensate) 1,104,599,075 bbl.

*Not incl. 21,200 bbl. condensate. †Incl. 5,655,600 bbl. condensate.

CRUDE-OIL STOCKS 224,098,000 bbl. as of August 10—down 734,000 bbl. One year ago 214,098,000 bbl.

GASOLINE STOCKS 87,016,000 bbl. as of August 10—up 275,000 bbl. One year ago 86,414,000 bbl.

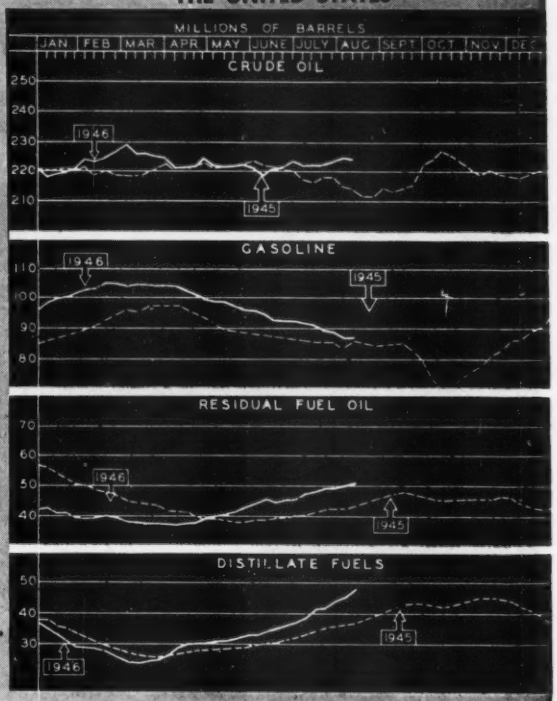
RESIDUAL FUEL-OIL STOCKS 51,613,000 bbl. as of August 10—up 1,475,000 bbl. One year ago 43,360,000 bbl.

GAS OIL AND DISTILLATE STOCKS 48,030,000 bbl. as of August 10—up 2,360,000 bbl. One year ago 36,969,000 bbl.

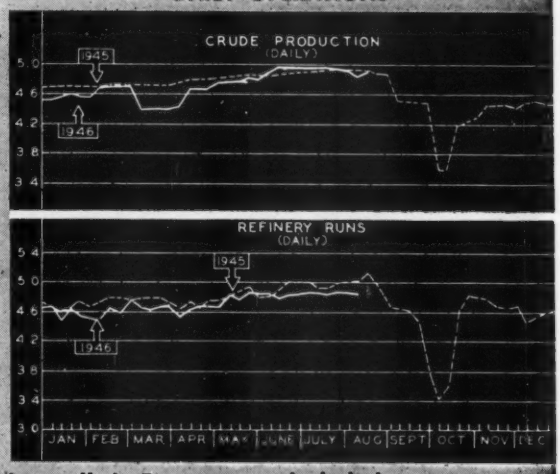
CRUDE-OIL PRODUCTION 4,860,118 bbl. as of August 17—up 36,398 bbl. One year ago 4,932,650 bbl.

REFINERY RUNS 4,806,000 bbl. daily week ended August 10—down 43,000 bbl. One year ago 5,036,000 bbl.

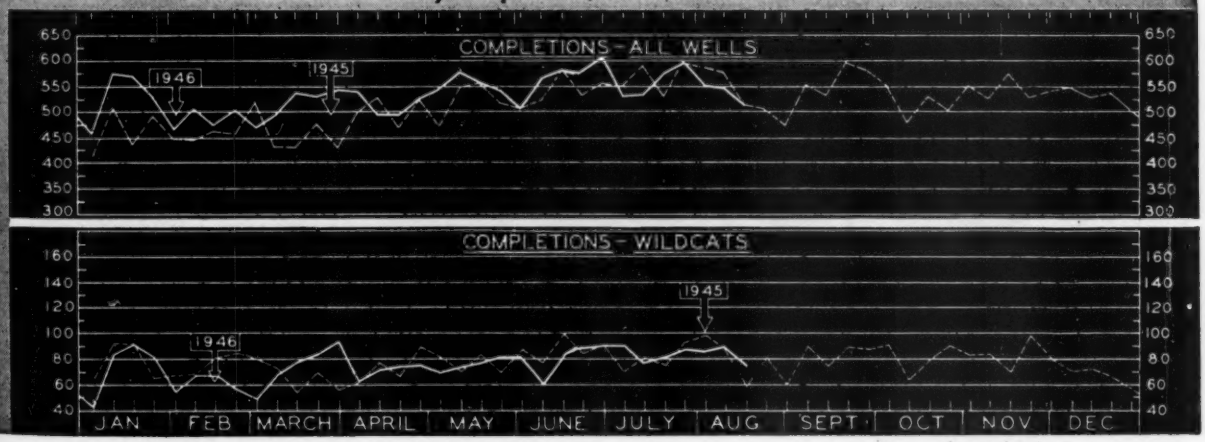
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included



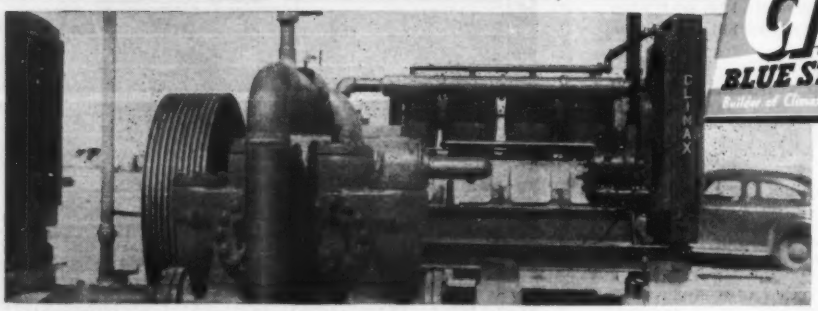
WORK HORSES of the Oil Fields!

The Men who Run them KNOW them best

CLIMAX FAST AND SMOOTH GET-AWAY plus rugged construction win quick praise from performance-wise drilling crews. Three of the Model VU-420 12-cylinder V-type engines (illustrated) compounded will develop a total of 1250 h.p. Here's the *on-the-job* power you need for deepest drilling.

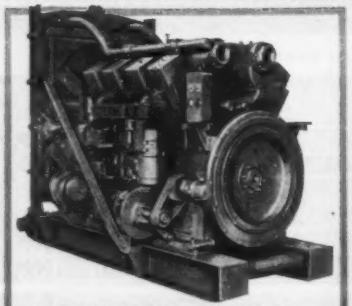
climax
BLUE STREAK ENGINE
Builder of Climax DIESELS and GENERATING SETS

CLIMAX ENGINEERING COMPANY

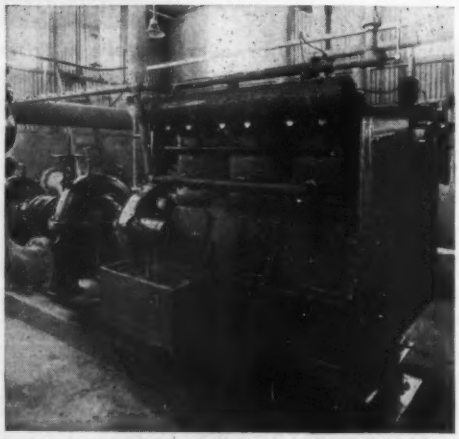


◀ **CLIMAX BLUE STREAK** engines being installed in pipeline pumping station.

▼ **CLIMAX R61** 6-cylinder engine driving water pump in large refinery. After 24,000 hours of *continuous* running, day and night, cylinder wear was .003" or less and only rings and one exhaust valve had to be replaced. Oil consumption: when new, 2 qts. per day; after 2¾ years constant service, only 4 qts. per day.



▲ **CLIMAX VU-280** rated 280 h.p. maximum at 1100 r.p.m. with radiator, fan and auxiliary equipment. 8 cylinders, 4 cycle, "V" type. A compact, powerful engine for deep drilling or heavy duty pumping.



* * *

CLIMAX OPERATING ADVANTAGES

Fast, smooth acceleration • Rugged construction • Medium speed • Easily accessible for maintenance • Parts stocked at all active field points • Expert field servicing.

GET THE FACTS on these heavy duty power units, built to *keep on* doing your toughest jobs. For bulletins giving detailed specifications and performance data, write Climax Engineering Company, General Offices, Clinton, Iowa. *Regional Offices: Chicago, Tulsa, New York. Factory Branch: Climax Industries, Inc., 901 Sinclair Bldg., Ft. Worth, Texas.*

MID-CONTINENT DISTRIBUTOR
The Continental Supply Company
General Offices, Dallas

CALIFORNIA DISTRIBUTOR
Climax Engines & Parts Company
2050 Santa Fe Ave., Los Angeles

Exploration and Drilling

Devonian Production at Mattoon?

OVERSHADOWING other recent developments in the Central West fields was the discovery of Devonian saturation in the Mattoon field of Coles County, Illinois. Of approximately five tests drilled to the Devonian in this field so far, the National Consumers Oil Co. 2 Herkimer, SW NW NE 11-12n-7e, is the first to indicate commercial production.

An old well drilled deeper, the 2 Herkimer topped the Devonian at 3,123 ft. and picked up the upper pay at 3,153-57 ft. and the lower pay at 3,157-65 ft. It was bottomed at 3,166 ft. and a 1-hour drill-stem test taken at 3,153-65 ft. Gas estimated at 8,000,000 to 10,000,000 cu. ft. daily developed almost immediately and the well started spraying oil at the end of 25 minutes. When the tester was pulled at the end of the test, 600 ft. of 33.5°-gravity oil was recovered in the drill pipe. Casing has been set to make a production test.

The first Devonian test drilled at Mattoon, the National Consumers 3 Herkimer, SW NE NE 11-12n-7e, ½ mile east of the 2 Herkimer, produced about 5,000,000 cu. ft. of gas and a slight amount of oil. The oil subsequently went to water, however, and the well was shut in. Still another test to show Devonian saturation was the H. & K. Drilling Co. 1 Anna Strong, SE SE SE 22-12n-7e. Drilled to a total depth of 3,120 ft., this well topped the Devonian at 3,082 ft., or 30 ft. structurally higher than any well in the field. Although the 1 Strong was drilled as a tight hole, rumors were persistent that on the basis of drill-stem tests it would make a 75-80-bbl. well. These proved false and the well was plugged temporarily and may be made into a salt-water disposal well at some later date. It was learned, however, that two porous breaks were encountered in the Devonian and some gas and oil recovered.

Most of the Illinois fields are basically structural traps, but production is determined primarily by sand conditions. In most cases it is not possible to predetermine field limits on the basis of structural extent as it is in many areas. In many fields the wells located at what would appear to be the best point on the structure may be dry while others located at less advantageous points may be extremely good wells. This is due to shaling out of sands and tightening up of the lime formations.

The Mattoon field is practically divided into two fields by shaling out of the sand south of the town of Mattoon. In addition, there are many dry holes in the middle of the field where the sand is too tight to produce. Some of these dry holes are offset by wells with high rates of production. It is therefore impossible to determine the possibilities of any one formation in this field without fairly extensive testing.

Since the tests already drilled to the Devonian at Mattoon have proved beyond a doubt that oil is present in that formation, the problem resolves itself into one of locating the spot in the field, if one exists, where porosity and permeability conditions are such as to permit commercial production. It is possible that the 2 Herkimer has found such a spot, although it will take considerable testing before this can be definitely determined.

EASTERN TEXAS

Rodessa Gas Zone Extended at Whelan

DALLAS.—A mile west extension for gas production seemed assured for the Whelan field of Harrison at Placid Oil Co. 1 Dunn, W. S. McBride Survey, after getting 19 ft. of Rodessa zone porosity at 6,680 ft. On a drill-stem test at 6,698 ft. the test flowed water cushion and recovered gas-cut mud. The well drilled ahead to top the Travis Peak at 7,390 ft., but no shows have been reported in that section. Elevation is 380 ft.

Humble Oil & Refining Co. 1 LeGory, Francis Hill Survey, wildcat 2½ miles east of Crockett, Houston County, cored the Woodbine from 7,334-41 ft. and recovered hard tight sand with no shows. Humble 1 Hale, J. S. Ables Survey, wildcat 1 mile north of Kemp, Kaufman County, was drilling below 4,950 ft. in lime and shale. Core from 4,595-4,605 ft. showed salt water sand.

Rogers Lacy 1 Key, Crocker Survey, 14 miles south of Marshall, Harrison County, is dry at 6,483 ft. after testing the Pettit and Travis Peak zones. Humble 2 Pickering, Woodfin Survey, in the Huxley area of Shelby County, was making an estimated 7,000,000 cu. ft. of gas daily with some water and a spray of 41° gravity oil from 6,652-70 ft. in the upper Pettit.

Talco field, Franklin and Titus counties, each had two locations this week, and Waskom field, Harrison County, Opelika field, Henderson County, and Huxley field, Shelby County, each had one. Hawkins field, Wood County, had seven completions and Carthage field, Panola County, four. Carthage field has 29 drilling wells; Hawkins field, 13; Henderson field, Rusk County, and Talco field, each have 5, and New Hope field, Franklin County; Sand Flat field, Smith County; Manziel field, Wood County; Waskom field and Opalika field each have four.

EASTERN TEXAS SUCCESSFUL WILDCAT

Harrison County: New gas pool—R. W. Williams 1 J. M. Furrh, Frances O'Neal Sur., 2 mi. N and slightly W Elysian Fields, elev. 365 ft., flowed 1,480,000 cu. ft. gas day, perf. 6,294-6,308 ft. Travis Peak, TD 6,851 ft.

EASTERN TEXAS WILDCAT FAILURE

Gregg County: B. F. Phillips 2 C. C. Crews, Leonard Perkins Sur., 6½ mi. S Gladewater, elev. 373 ft., Woodbine 3,710 ft., dry, TD 3,742 ft.

TEXAS GULF COAST

Saratoga Field Gets New Pay and Extension

HOUSTON.—A new oil sand has been opened at Saratoga field in Hardin County by L. M. Josey et al 3 Caswell Trust, which flowed a potential of 162 bbl. of 39-gravity oil daily through a 9/64-in. choke through 280 perforations at 5,698-5,768 ft. Total depth is 5,970 ft. Flowing pressure on the tubing is 800 lb., and casing pressure 1,000 lb. This well is located on the northeast flank of the field.

Ohio Oil Co. 1 Kirby Lumber Co., Tract 3, wildcat, in the McCoy field area, Liberty County, flowed oil and wash water through 12/64-in. choke with 775 lb. flowing pressure on the tubing and 1,250 lb. pressure on the casing. The 5½-in. casing is cemented to 9,257 ft. with perforations from 9,135-44 ft. for completion. Total depth is 9,773 ft. Well is still cleaning, showing 30 per cent wash water with a slight brackish taste. This well is 5,710 ft. southwest of the discovery well for the McCoy field.

Johnny Mitchell et al 1 R. P. Smith, Unit 21, western outpost to production at Caplan in Galveston County, in Minor Knowlton Survey, made an initial test at 5,232-40 ft. and flowed gas with some salt water. Perforations have been squeezed and operators are preparing to test the 4,000-ft. sand. Total depth is 7,800 ft. with 5½-in. casing cemented to 5,300 ft. level.

Houston Oil Co. and American Republics Corp. 1 Thos. Penny fee, deep test which had showed for some gas and condensate production, has been plugged as a dry hole. Total depth is 11,000 ft. Two drill-stem tests were made, both of which showed some gas and condensate, but had no flowing pressure.

Second test in El Maton field, recent discovery, is preparing to make an initial test for production. This test, Ralph A. Johnston 1 Live Oak Farms, 4,500 ft. south of discovery oil well for El Maton, was drilled to total depth of 9,002 ft., and 5½-in. casing cemented at 8,901 ft.

Jack Frazier's second attempt in the area southeast of Jackson Pasture in Chambers

County, has been plugged as a dry hole. The 2 E. A. Wilborn Estate, in T&NO Survey, was drilled to a depth of 10,019 ft. with no shows.

Sugar Valley field in Matagorda County received another good oil well when Stanolind Oil & Gas Co. 1-B Helen E. Hurlock flowed a potential gage of 187 bbl. of 32-gravity oil through a ⅛-in. choke. Flowing pressure on tubing 1,275 lb., and 1,200 lb. pressure on casing. Total depth is 9,200 ft. and 7-in. casing is cemented to 9,199 ft. Production is through 30 perforations at 9,007-9,012 ft.

Magnolia Petroleum Co. has named their new oil discovery area 3 miles northeast of Blessing townsite in Matagorda County, "El Maton." The discovery well is 1 Live Oak Farms, which flowed a potential of 160 bbl. of 41-gravity oil daily through a ⅛-in. choke with 1,300 lb. flowing pressure of the tubing. Production is through 25 perforations at 8,450-56 ft.

The 20 new locations reported this week included seven wildcats; two each in Chambers, Liberty, and Montgomery counties, and one in Harris County. Liberty County took the lead with four locations reported, two wildcats and each each in Esperson and Hull fields. Matagorda County, received three locations while Brazoria, Chambers, Montgomery, and Wharton each received two. One oil discovery was reported this week in Matagorda County, while five wildcats, two in Harris, one each in Chambers, Hardin and Wharton counties, were

UPPER GULF COAST SUCCESSFUL WILDCATS

Matagorda County: New oil pool, El Maton field—Magnolia Pet. Co. 1 Live Oak farms, J. W. E. Wallace Sur., 1 mi. W of El Maton and 3 mi. NE of Blessing townsite, TD 11,157 ft., PBTD 8,468 ft., top sand 8,450 ft., perf. 8,450-56 ft., PT 160 bbl. per day through a ⅛-in. choke, gas-oil ratio 744 to 1, TP 1,300 lb., 41° gravity, no water.

UPPER GULF COAST WILDCAT FAILURES

Chambers County: Jack W. Frazier 1 E. A. Wilborn Est., T&NO Sur., in Jackson Pasture area, dry, TD 10,019 ft.

Hardin County: Houston Oil Co. of Texas 1 Houston & American Republics fee, Thos. Penny Sur., 8 mi. SW of Warren, dry, TD 11,000 ft.

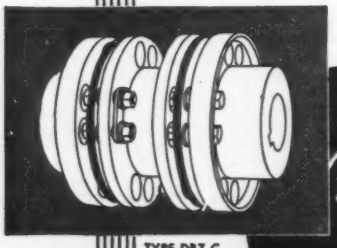
Harris County: Jack Frazier and Dick Schwab 1 August Fuchs, in Fairbanks area, BBB&C Sur., dry, TD 7,902 ft.

Humble 1 Nora C. Kramer et al, C. D. Collins Sur., in North Delhi area, dry, TD 7,513 ft.

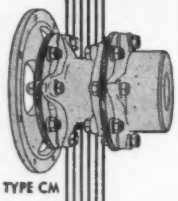
Wharton County: Albert G. Blanke, Jr. 1 Louise Hutchins and Hallie Pearson, HE&WT Sur., 10 mi. NW of Louise townsite, dry, TD 5,375 ft.

Jackson County: Renwar Oil Corp. 1 H. E. Mercer, Wm. Menefee Sur., 3 mi. S of Ganado, dry, TD 4,997 ft.

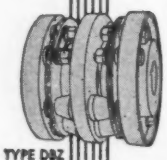
THOMAS
Flexible COUPLINGS
FOR HOT OIL PUMP DRIVES or any other service where 100% dependability is demanded



TYPE DBZ-C



TYPE CM



TYPE DBZ

THOMAS Flexible COUPLINGS provide for Angular and Parallel Misalignment as well as Free End Float . . . and Eliminate BACKLASH, FRICTION, WEAR and CROSS-PULL
NO LUBRICATION IS REQUIRED!

The Thomas All-Metal Coupling does not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

Write for Complete Engineering Catalog!

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

APPALACHIAN FIELD

Second Rockingham Test Is Dry in Oriskany

PITTSBURGH, Pa.—Near Bergton in Rockingham County, Virginia, the second rotary test of the James Oil & Gas Co. is reported to be 10½ ft. in the Oriskany sand and dry. At that point, a very hard formation was struck and drilling halted. It was bailed down and shot, but with no showing of gas. This test is located about 1¼ miles northwest of the original cable tool test on the Souder farm which is a small gas well in the Oriskany sand. The rotary rig has been shipped back to Kansas.

In the new oil pool in North Strabane Township, Washington County, southwest Pennsylvania, Charles E. Young is completing 2 H. A. Walker. The hole has filled up within a few feet of the top and has made several small flows. The No. 1 is a small Gantz sand well.

On Chestnut Ridge in Georges Township, Fayette County, Manufacturers Light & Heat Co. topped the Onondaga chert at 7,401 ft. in 7 Barton and at 7,418 ft. struck a volume of gas which gaged as high as 3,000,000 cu. ft. It is being deepened and now gages 1,850,000 cu. ft.

In Jackson Township, Greene County, Manufacturers Light & Heat Co. completed the H. G. Jones well in the Injun sand for 793,000 cu. ft. gas. The Injun was topped at 2,243 ft., gas at 2,318-33 ft., total depth 2,338 ft.

New work listed for the week totaled four and in Bethel, Kittanning and Wayne townships, Armstrong County; Bell Township, Westmoreland County.

In Ripley district, Jackson County, West Virginia, Mill Creek Gas Co. topped the Oriskany sand at 4,921 ft. in the wildcat on Anna B. Vail farm and at 4,953-57 ft. there is a showing of 133,000 cu. ft. gas only. It is drilling at 4,973 ft.

In the extension to the Elk-Poca Oriskany field in Kanwha County, Columbian Carbon Co. topped the Corniferous lime at 4,829 ft. from a surface elevation of 644 ft. in the test 907 W. H. Vickers. United Fuel Gas Co. topped the Corniferous at 5,133 ft.; from surface, 1,015 ft. in No. 5,740 Ego Gallati and in Big Sandy district, has reached the Corniferous and pulling the 8-in. casing at 5,300 ft. in deepening No. 783 on the same tract.

New locations during the week totaled 10 in Sherman district, Calhoun County; Buffalo district, Clay County; Washington district, Lincoln County; Union district, Marion County; Kermit district, Mingo County; Teays Valley district, Putnam County; Clay district, Ritchie County; Geary district, Roane County; Slab Fork district, Wyoming County.

REED ROCK BITS

and Lighter Drilling Weights

. . . and also saved an appreciable amount of money on rig maintenance costs."

AN oil company engineer recently made a survey on 34 rigs in Oklahoma and found that the rigs using light drilling weights (18,000 lbs. or less) reached total depth in 4 days less time than rigs using heavy drilling weights (36,000 lbs. or more).

This represents a very worth while saving to the operator, not only in rig time, but in preventing excessive wear and strain on rig equipment all the way down.

Reed Rock Bits are designed to drill efficiently and safely with heavy drilling weights and high rotary speeds. **However, the inherent characteristics of the Reed cross-roller principle of design permit faster drilling with lighter weights.**

REED ROLLER BIT CO.
HOUSTON 1, TEXAS

Specify the

REED "T"
. . . for soft formations, such as shale, salt, red beds, unconsolidated sands and soft limestones.

REED "2T"
. . . for soft formations interspersed with streaks of abrasive sands.

REED "M"
. . . for medium hard formations, such as chalk, anhydrite, gypsum, medium hard shale and some of the softer lime formations.

REED "HM"
. . . for medium hard drilling where the formations do not contain an appreciable amount of abrasive material, such as medium hard and abrasive limestones.

REED "2HM"
. . . for medium hard drilling where abrasive materials are encountered, such as medium hard abrasive limestones, etc.

REED "2H"
. . . for slightly harder formations than those recommended for the "2HM", such as the hard dense limestones, abrasive limestones and sands.

REED "2"
. . . for medium hard formations which chip easily, such as: anhydrite, hard lime rock, hard shale, etc.

REED "2C"
. . . for drilling the very hard and abrasive formations, such as chert, hard lime and the dense, abrasive sands.

ROCK BITS

Unitized for Greater Strength!

SOUTHWEST TEXAS

Charlotte Field Gets Good Extension Well

CORPUS CHRISTI.—Production has been extended 1½ miles southeast at Charlotte field in Atascosa County by The Texas Co. 1 R. B. Love. Drilled to a total depth of 5,355 ft., this well gaged 35 bbl. of 31-gravity oil on pump per day, with gas-oil ratio of 560 to 1. Top of the Navarro sand was found at 5,183 ft., and production is through perforations at 5,187-97 ft., 5,208-22 ft., and 5,252-60 ft. in the Navarro zone. This company's 1 Earl D. Scott is being drilled approximately 1 mile southeast of the Love well.

A new deeper pay zone for the southern tip of the Kelsey field in Starr County, has been opened by J. O. Clark 2-A Gonzales Unit. It flowed 145 bbl. of oil per day through a ⅛-in. choke on initial test through perforations at 5,709-18 ft. This well is approximately 6 miles southwest from present production in the 5,700-ft. pay, which lies on extreme northeast tip of the field, in Brooks County, and may possibly mean a 6-mile extension to that production. On a 15-minute drill-stem test at 5,505-10 ft., recovered 300 ft. of 38°-gravity oil and 100 ft. of salt water, 60 lb. working pressure.

Humble Oil & Refining Co. 2 King Ranch-Borregas, approximately 1 mile southeast of 1 King Ranch-Borregas discovery well 8½ miles southwest of Kingsville, in Kleberg County, recovered oil on drill-stem test in a second new pay sand at 5,109-16 ft., recovering 675 ft. of oil and 10 ft. of oil-cut mud. On previous test at 4,865-78 ft., recovered 640 ft. of oil and 120 ft. of oil and water. Both of these pays are above the depth at which the discovery well was completed, being 6,889-95 ft., with total depth of 8,549 ft.

A new gas-condensate discovery about 3 miles northwest of Refugio townsite in Refugio County, has been indicated by Wil-Tex Oil Corp. and Herman E. Brown 1 Jamie Hynes. On drill-stem test at 6,490-98 ft. the well developed 330 lb. working pressure in 5 minutes, and recovered 245 ft. of gas-and-condensate-cut mud and 5 ft. of free condensate. On drill-stem test at 6,504-14 ft. developed 90 lb. working pressure and recovered 90 ft. of oil-and-gas-cut mud and 725 ft. of salt water in 8 minutes. Operators are now trying to free stuck drill pipe at 6,662 ft.

Magnolia Petroleum Co. 2 F. Armendaiz, wildcat in share IV, of San Juan de Carricitos grant, Willacy County, recovered four sands of condensate with 3,750 lb. bottom-hole pressure flowing and 3,975 lb. shut in, on drill-stem test at 8,596-8,607 ft. Operators are reaming down at the total depth of 8,636 ft.

H. H. Howell 3 Singer, on east flank of Palangana salt dome in Duval County, has been completed as a shallow gas well with good volume. The producing sand is at 1,683-1,705 ft. and the well is estimated good for 50,000,000 cu. ft. of dry gas per day on open flow. On a ¼-in. choke the well flowed 1,050,000 cu. ft. gas per day with 714 lb. tubing pressure, and on ⅛-in. choke it gaged 248,500 cu. ft. gas with 725 lb. tubing pressure. The shut-in pressure was gaged at 730 lb.

West Pridham Lake field, Victoria County, has been extended to the northwest by Rupert Cox and Taylor Refining Co. 1 Meyers et al. Test recovered 2,000 ft. of clean oil on drill-stem test at 4,775-78 ft. using 500 ft. water cushion, open 15 minutes, bottom-hole pressure flowing 1,800 lb. Total depth is 4,820 ft., and casing is being set for the completion.

There were 45 new locations reported this week with 8 being wildcats, 2 in Duval and 1 each in Hidalgo, Live Oak, Nueces, San Patricio, Uvalde, and Webb counties. Kleberg County received the greatest activity with five locations for Seeligson field reported and eight for Tijerina-Canales field. Five new locations were reported for Duval County. One new gas pool and 2 oil pays were completed in Southwest Texas district this week, the new gas pool in Duval, and the oil pays, one each in Nueces and Starr counties. Six dry wildcats, one each in Bastrop, Brooks, Duval, Jim Hogg, McMullen, and Milam counties, were reported.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Duval County: New gas pool—H. H. Howell 3 Lizzie Singer, G. Cumberland Sur. 4, 5 mi. N of Benavides, top pay 1,683 ft., TD 1,725 ft., perf. 1,683-1,705 ft., IP flowed 248,500 cu. ft. gas per day through a ⅛-in. choke, TP 725 lb., SIP 730 lb., no water.

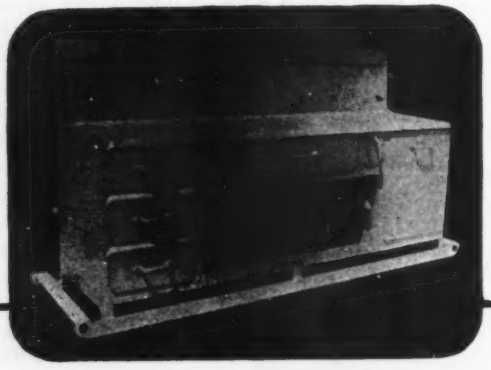
Nueces County: New oil pay, North Minnie Bock field—Atlantic Refg. Co. 1 Geo. Renken, Section 46, Geo. H. Paul Subd. of Robt. Driscoll Ranch, top pay 7,870 ft., TD 9,431 ft., perf. 7,877-81 ft., PT 185 bbl. oil per day through a ⅛-in. choke and 9/64-in. choke, gas-oil ratio 676 to 1, TP 660 lb., casing sealed, gravity 29°, no water.

Starr County: New oil pay, Kelsey field—J. O. Clark, Jr., 2-A Gonzales unit, Santa Teresa grant, on south flank of field, top pay 5,706 ft., TD 5,739 ft., perf. 5,709-18 ft., PT 149 bbl. oil per day through a 5/32-in. choke, gas-oil ratio 603 to 1, TP 600 lb., CP 1,250 lb., gravity 42°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Bastrop County: J. C. Tittle 1 Martin McDonald, Martha Barker Sur., 2 mi. NE of Bastrop, dry, TD 803 ft.

Brooks County: Humble 1 W. B. Gardner-



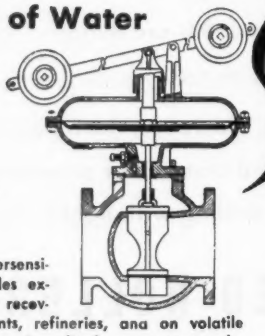
The Industry's Finest
WORK BENCH

The Owen Tool Chest and Work Bench is standard equipment on modern drilling rigs. Built of 3/16" steel, welded throughout and mounted on skids, it is very sturdy . . . will withstand many moves and hard use. The roller mounted drawers have a central locking system. Rain hood over each drawer protects tools against rain damage. Sturdy vise stand conveniently located.

Dimensions: back height 4½'; front height 32"; depth 30"; length 8'; approximate weight 1100 lbs.

OWEN TOOL COMPANY
ROUTE 9 BOX 800-B V-2-4341
HOUSTON, TEXAS

Pressures of Less Than
One Inch of Water
operate
this DAVIS
GAS RELIEF
VALVE!



• The Davis No. 335W Supersensitive Gas Relief Valve provides exceptional sensitivity on vapor recovery systems in chemical plants, refineries, and on volatile liquid storage tanks. An oversize diaphragm assures dependable operation on a fraction of an inch of water!

The by-pass valve for throttling gas flow steadies valve action and prevents vibration under the most severe operating conditions. There is no pulsation.

The diaphragm chamber is close coupled to the body. There is no packing box. Exclusive rain cap protects the diaphragm in outdoor installations.

These features assure sensitive, efficient, economical, trouble-free service. Write for Bulletin G-1.

Davis Regulator Co., 2543 S. Washtenaw Ave., Chicago, Ill.

DAVIS REGULATOR COMPANY

Distributor: Westcott & Greis, Inc., Tulsa and Houston

State, J. F. Dawson Sur. 348, 12 mi. SE of Falfurrias, dry, TD 10,991 ft.

Duval County: Humble 1-D Dallas Jt. Stock Land Bank, Elizabeth Gravis Sur., 16 mi. S of Freer, dry, TD 3,072 ft.

Jim Hogg County: Humble 23 Mrs. A. M. K. Bass, San Rafael Grant, dry, TD 8,253 ft.

McMullen County: Joe C. Palmer 1 Cooper & Martin, in ETRR Co. Survey 6, 4½ mi. SW of Loma Alta-Wilcox field, dry, TD 3,071 ft.

Milam County: W. F. Glen 1 A. R. O'Neal, in Jose Leal Survey, 7 mi. NE of Rockdale, dry, TD 4,121 ft.

CANADIAN FIELDS

Oiler Is Added To Baxter Lake Field

CHATHAM.—In the Baxter Lake area, northeast of the Wainwright field in east central Alberta, Baxter Lake 1, LSD 12, 20-46-5w4, bottoming at 2,088 ft., has made water shutoff and developed flush production of around 75 bbl. of 16-gravity oil. Recovery shows about 10 per cent water. The well, which is being placed on the pump, is the first of a series of joint tests by Baxter Lake Oils, Royal Canadian Oil Co. and Union Drilling Co.

Provost.—In the Provost area, eastern Alberta, Imperial-Provist 1, LSD 3, 27-37-3w4, discovery well, finished at 2,549 ft., has steady production around 25 bbl. of 20-21 gravity crude. Production comes from the top of the lower Cretaceous, with gas enough to flow the oil. Imperial-Provost 2, LSD 1, 33-37-3w4, about 1 mile northwest, is below 3,132 ft. with no production reported. Imperial-Provost 3, LSD 6, 27-20-3w5, ¼ mile north of discovery, has 2,500,000 cu. ft. gas from the Viking sand at 2,637 ft. Commoil, Ltd., of Calgary has location in LSD 5, 24-35-2w4, 7 miles south and east of discovery.

Beaver Hill Lake.—East of Edmonton the Home Oil-Anglo Canadian-C. & E. group has located Beaver Hill Lake 1, 10 miles south of Mundare, in a previously untested area. Elk Point 1-A, LSD 7, 26-56-5w4, joint test by the same interests, has finished at 1,653 ft. with 7-in. casing set and is perforating to test showings in the lower Cretaceous. Drilling permit is being secured for a third Elk Point test, while plans are matured for utilizing gas and salt production in Elk Point 1. The group has secured a new reservation of 135,669 acres east and west of its previous Elk Point holdings.

Pinhorn.—On the Pinhorn Dome in southern Alberta, McColl Frontenac-Union 9A-22-3-8, LSD 9, 22-3-8w4, finished drilling at 3,183 ft. and plugged back to 2,394 ft. where drill-stem tests indicated 3,500,000 cu. ft. of gas. The well, close to the Montana border, is being completed as a gasser.

Keho Lake.—In the Keho Lake area, southern Alberta, Okalta-Keho 1, LSD 1, 16-11-22w4, got Madison contact at 4,857 ft. and set 7-in. casing a few feet in. Showings in the top of the lime are being tested.

Stolberg.—On the Stolberg structure in the central foothills, Imperial-Shell-Stolberg 1, LSD 3, 22-41-14w5, the deepest test yet drilled in Alberta, is below 13,679 ft. with more than 853 ft. in limestone.

Gaspe.—In the Gaspe Peninsula of Quebec, Venture 1, drilled by Gaspe Oil Ventures, Ltd. of Montreal, found oil and gas showings on resuming at 1,027 ft. Shows were from a dark brownish grey shale with a proportion of light grey sandstone at 1,022-27 ft. No evidence of porosity or oil saturation was found but the showings persisted and are believed to have come from an underlying porous zone, which may be met in the next 200 ft. Limestone had been expected at 2,000 ft. with production 355 ft. in, but the lime may be higher than anticipated.

Drop-Forged STEEL FLANGES

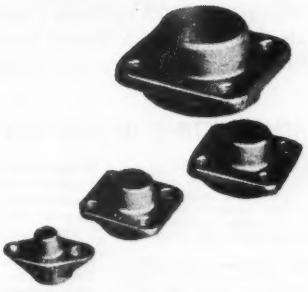
Harrisburg Drop-Forged Steel Flanges are known for their strength, endurance and precision standards of threading and machining.

Harrisburg Makes:

Alloy and Carbon Steels; Seamless Steel CO_2 Liquefiers, Pipe Couplings, Slush Pump Liners and High Pressure Gas Cylinders; Drop Forgings; Forged Steel Pipe Flanges; Coils and Bends.

The threading operation is fully as vital a contribution to the qualities of Harrisburg Flanges as is the fact that they are forged from steels melted in Harrisburg's open hearth furnaces. The threads are rugged and perfect in height, angle, taper and gauging. All Harrisburg Flanges are made to A. S. A. standards.

A complete line of Harrisburg Flanges is available in standard types or for special purposes.



HARRISBURG STEEL CORPORATION

Established 1853

HARRISBURG, PENNSYLVANIA

Send for this NEW FLANGE Catalog

Send for the new Harrisburg Drop-Forged Flange Catalog. It contains dimensions, tables of sizes and complete buying information.

PERMIAN BASIN

Glasscock Wildcat Drilling After Showing Oil, Gas

MIDLAND.—Shell Oil Co., Inc. 1 L. T. and L. C. Clark, Section 5, Block 32, T-4-S, T&P Survey, wildcat 8 miles north of Garden City, Glasscock County, ran a 60-minute drill-stem test from 9,700-9,805 ft. in the top part of the Ellenburger. There was sweet gas in 10 minutes, estimated at 500,000 cu. ft. Recovery was 50 ft. of 47° gravity oil, 300 ft. of gas-cut mud and 200 ft. of salt water. On a later 90-minute drill-stem test from 9,835-55 ft. it recovered 34 ft. of gas-cut mud and 749 ft. of salt water. There was no show of oil. It is drilling ahead.

Shell 1 Elizabeth Pinson, Section 13, Block A-40, Public School Land, ¾ mile southwest of Shell 1 Nelson, recent Ellenburger discovery in western Andrews County, on a 1-hour drill-stem test from 10,674-700 ft. recovered 640 ft. of 37.1° gravity oil, 90 ft. of muddy oil and 360 ft. of salt water. It is thought the test is just in the top of the true Ellenburger and that the water is coming from the bottom of the Joins formation which is just above the Ellenburger. Operator will drill deeper and take another drill-stem test. Placid Oil Co. and Gulf Oil Corp. 1 M. A. Thornberry, Section 5, Block A-42, Public School Land, Ellenburger discovery 1½ miles north of the west end of the Fuhrman Mascho pool, Andrews County, pumped 75 bbl. of oil, 4 bbl. basic sediment and 392 bbl. of water in 13 hours through casing. Operators will continue to test on the pump at 11,957 ft.

Ralph Lowe 1 Sealy-Smith, Section 71, Block A, G&MMB&A Survey, wildcat 2½ miles northwest of the North Monahans field, Winkler County, which recovered good pay from the Holt zone of the Glorietta from 5,026-75 ft. seems to have failed to find pay in the Clear Fork. On a drill-stem test from 6,200-6,312 ft., with tool open 1 hour, recovery was 800 ft. of salt water with no shows of oil or gas. The test will be drilled to contract depth of 6,500 ft. Stanolind Oil & Gas Co. 8 Sealy-Smith Foundation, Section 48, Block A, G&MMB&A Survey, wildcat in the North Monahans area, Winkler County, has been completed to flow 422 bbl. of oil daily through 16/64-in. choke following treatment with 2,000 gal. of acid. Gas-oil ratio was 1,216 to 1. Top of the pay was 5,180 ft. Gravity was reported to be 27°.

Cities Service Oil Co. 1 J. E. Parker, Section 20, Block 44, T-2-S, T&P Survey, Ellenburger prospect west of the Harper pool, Ector County, lost the swab and was fishing. Operator had started swabbing in an effort to get the well to kick off through tubing after it had unloaded 7,600 ft. of 43° gravity oil through perforations from 11,455-470 ft. The well had been acidized with 2,000 gal.

Welch field, Dawson County, had four completions; TXL field, Ector County, three, and Waddell field, Crane County; Fullerton field, Andrews County, and Sprayberry field, Dawson County, each had two. Sharon Ridge field, Scurry County, had four locations and Fullerton field, Slaughter field, Cochran County, and Waddell and Sand Hills Tubb fields, Crane County, each had two. TXL field has 36 drilling wells; Fullerton field, 29; Keystone-Ellenburger field, Winkler County, 24; Welch field, 10; Keystone-Holt field, Winkler County, 7; Todd Deep field, Crockett County, and Keystone-Colby field, Winkler County, each 6.

WEST TEXAS WILDCAT FAILURES

Crockett County: Moore Exploration Co. 3-C Halff Est., Sec. 69, Blk. 1, I&GN Sur., 2 mi. W Noelke pool, elev. 2,373 ft., dry in Clear Fork, TD 3,372 ft.

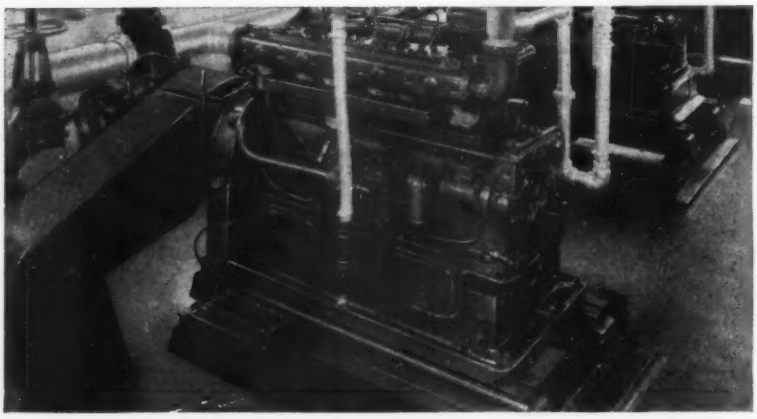
Irion County: John I. Moore 1 Mrs. Elta Murphy, Sec. 1227, GC&SF Sur., 1 mi. NW Monument, elev. 2,566 ft., Ellenburger 7,965 ft., dry, TD 8,398 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Pure Oil Co. 1 Federal, 31-3n-28e, DeBaca County wildcat 13 miles east of Fort Sumner, drilled the base of the Abo at 5,085 ft. Elevation is 4,135 ft. It was drilling below 5,340 ft. in lime and shale. Magnolia Petroleum Co. 1 Black Hills unit, 31-37s-20e, southwestern Chaves County wildcat about 25 miles west of Artesia, was making hole below 1,948 ft. in lime and anhydrite. This wildcat is scheduled to go to around 8,000 ft.

Tide Water Associated Oil Co. 2 Clifton, 4-22s-37e, ¾ mile northwest of the nearest Ellenburger well on the north side of the Brunson field, was testing through casing perforations in the Ellenburger between top of that formation at 8,005 ft. and the total depth at 8,097 ft. The section from 8,015-35 ft. flowed an average of 11.4 bbl. of oil per hour, natural, for 25 hours. Operator was testing another section of the formation. Repollo Oil Co. 1 Simmons, 25-21s-37e, eastern Lea County wildcat about 2 miles northeast of Eunice, had reached 8,695 ft., and was drilling ahead in an unidentified formation. Operator is not releasing any information on the progress of this well except the drilling depths.

Drinkard field, Lea County, and Russell field, Eddy County, each had two completions. Fren and Grayburg-Jackson fields, Eddy County, each had two locations, and South Eunice and Paddock fields, Lea County, each had one. Drinkard field has 15 drilling wells; Grayburg-Jackson field, 14; Paddock field, 9; Square Lakes field, Eddy County, 8, and Langlie-Mattix, Brunson and Maljamar fields, Lea County, 4 each.



Its "Little Troubles" Will Never Grow Up!

No sir, little troubles . . . like low lube oil pressure or overheated cooling water . . . will never grow up into major breakdowns when your engine is equipped with PENN Safety Controls. Let some minor trouble occur in the lubricating or cooling system . . . and this protective device warns instantly. Thus, it is possible to correct slight engine faults before they cause serious damage. Write for copy of Bulletin E-100B to *Penn Electric Switch Co., Goshen, Ind.* Export Division: 13 E. 40th Street, New York 16, U. S. A. In Canada: Penn Controls, Ltd., Toronto, Ontario.

TYPICAL FUNCTIONS OF PENN SAFETY CONTROLS

Diesel Applications: Sounds an alarm only . . . closes magnetic fuel valve and sounds alarm . . . closes magnetic fuel valve only . . . closes magnetic fuel valve and opens pilot relay.

Battery Ignition Applications: Opens battery circuit and sounds an alarm . . . sounds an alarm only . . . opens battery circuit only.

Magneto Ignition Applications: Sounds an alarm only . . . grounds single or dual magneto . . . grounds magneto and sounds an alarm or lights a signal light.

Dual Ignition Applications: Opens battery circuit and grounds magneto.

Built in three basic models: oil pressure only, water temperature only, and combination model (illustrated).

PENN AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, ENGINES, PUMPS AND AIR COMPRESSORS

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Lea County: C. W. Chancellor Oil Co. 1 State, 27-17s-33e, 3 mi. W Vacuum pool, elev. 4,213 ft., Grayburg 4,124 ft., San Andres 4,470 ft., dry, TD 4,701 ft.

SOUTH LOUISIANA

Charenton Deep Well Testing Oil Shows

NEW ORLEANS.—Pan American Production Co. 25 Laws Realty Co. at Charenton field, 25-13s-9e, St. Mary Parish, a prospective deep pay discovery, is testing in sands showing oil from 6,385-6,450 ft. Operators drilled to a total depth of 7,553 ft. before plugging back for 5½-in. setting at 6,553 ft. New location for 26 Laws Realty Co. has been staked 1,300 ft. south and 100 ft. east of the NW NW of 31-13s-10e. Proposed depth is 7,500 ft.

Another deep test location for Pan American is 19 H. L. Garland "South," in Port Barre field in St. Landry Parish, which will be drilled to a depth of 10,500 ft.

Sands showing gas and condensate have been reported at 7,010-20 ft. and 8,115-20 ft. in Stanolind Oil & Gas Co. 8 South Jennings Unit, deep test in the South Jennings field of Jefferson Davis Parish. Operators are drilling below 9,524 ft. It is scheduled to go 12,000 ft.

Sohio Petroleum Co. 1 J. A. Fontenot et al, ½ mile north outpost on the west side of present production at Bon Air field in Jefferson Davis Parish, 16-10s-6w, has been completed dry at a total depth of 10,157 ft. This test is ½ mile north of the 2-B Fontenot well which produces from the same level with the discovery well.

Union Producing Co. et al 1 Tyler is a confirmation test for the 1 Belgard, Tuscaloosa oil discovery in the Big Island field of Rapides Parish. It is located in the center of NE NE 14-4n-3e, which is ½ mile east of the discovery well. Contracted depth is 10,000 ft.

Golden Meadow field area of Lafourche Parish received two new deep tests, the first in 2 years. Barnsdall Oil Co. 1 Tamplain & Talbot, 26-19s-22e, is drilling below 1,150 ft., and The Texas Co. 29 LL&E-Golden Meadow, 78-19s-21e, is drilling sandy shale below 2,625 ft. Both tests are scheduled to be drilled below 10,000 ft.

St. Mary Parish received the greatest number of new locations this week with

NEED NEW

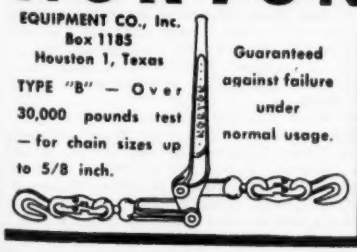
BOOMERS for your OIL FIELD HAULING?

You can get them now! Norton Type "B" and Type "J" drop forged, heat treated steel Load Binders (Boomers) are ready for immediate delivery. Order them through your jobber.

NORTON

EQUIPMENT CO., Inc.
Box 1185
Houston 1, Texas

TYPE "B" — Over 30,000 pounds test — for chain sizes up to 5/8 inch.



Guaranteed against failure under normal usage.

SERVICE STEPPED UP

AT LOWER COST FOR ALL AIR EXPRESS SHIPMENTS

NOW! THE LID IS OFF

More Planes, More Flights — For Everybody. Priorities No Longer Needed!

More Planes in service, more flights, more space available for all kinds of traffic! Bigger planes, swifter planes, faster air schedules on many runs!

Every way you figure, Air Express service is stepped up to an all-time high at an all-time low in cost to the shipper.

Reduced Rates (see table) include special pick-up and delivery between airport towns and cities. Rapid air-rail schedules to and from 23,000 other communities in this country.

Foreign Service direct by air to and from scores of foreign countries — the world's best service, in the world's best planes.

Write Today for the Time and Rate Schedule on Air Express. It contains illuminating facts to help you solve many a shipping problem. Air Express Division, Railway Express Agency, 230 Park Avenue, New York 17. Or ask for it at any Airline or Railway Express office.

RATES CUT 22% SINCE 1943 (U. S. A.)

AIR MILES	2 lbs.	5 lbs.	25 lbs.	40 lbs.	Over 40 lbs. Cents per lb.
149	$1.00	$1.00	$1.00	$1.23	3.07c
349	1.02	1.18	2.30	3.68	9.21c
549	1.07	1.42	3.84	6.14	15.35c
1049	1.17	1.98	7.68	12.28	30.70c
2349	1.48	3.53	17.65	28.24	70.61c
Over 2350	1.47	3.68	18.42	29.47	73.68c

INTERNATIONAL RATES ALSO REDUCED

AIR EXPRESS — GETS THERE FIRST

Phone AIR EXPRESS DIVISION, RAILWAY EXPRESS AGENCY
Representing the AIRLINES of the United States

five reported. All are in proven areas. One new oil pay was reported in Lake Mongoulois field, St. Martin Parish, while one wildcat was dry in Calcasieu Parish. There were six completions, two oil, one gas, and three dry holes.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

St. Martin Parish: New oil poy, Lake Mongoulois field—Texas Co. 5 State-Lake Mongoulois, in Lake-10s-9e, TD 10,833 ft., perf. 10,666-704 ft., PT 238 bbl. per day through a ⅛-in. choke, gas-oil ratio 705 to 1, TP 1,400 lb., gravity 25°, no water.

SOUTH LOUISIANA WILDCAT FAILURE

Calcasieu Parish: Union Sulphur Co., Inc. 1 M. P. Erwin Estate, in Maplewood area, 6-10s-9w, 1 mi. NW of Lockport production, dry, TD 8,677 ft.

MICHIGAN

Allegan County Gets Two Large Wells

SAGINAW.—Oil activity in Michigan centered in Allegan County in the past week as a 360-bbl. well was completed in Monterey Township and a 300-bbl. producer developed in the new Casco area. Two other Casco tests were dry as were others in Fillmore and Dorr Townships.

Of the 21 completions in the state, in 10 counties, 5 were oil wells, 5 were gas wells, 11 were dry holes, 3 of those being wildcat tests. An equal number of new locations were announced, the new ventures mostly for natural gas development.

Michigan Consolidated Gas Co., which reported the five new gas wells in Osceola and Newaygo counties for combined initial potential of 42,000,000 cu. ft., announced 11 new locations in the Newaygo-Goodwell field.

Aside from the two Allegan oil wells, smaller producers were reported in Gratiot, Muskegon and Van Buren counties.

Four more locations were announced in Allegan County, one each in Oceana, Osceola, Arenac, Ipsco, Isabella and Saginaw, and two in Ottawa.

MICHIGAN WILDCAT FAILURES

Allegan County, Fillmore Township: J. W. Lang Co. 1 J. Lubbers, SW SW NW 9-4n-15w; dry in Traverse Limestone; TD 1,510 ft.

Arenac County, Arenac Township: American Drilling Co.-Michigan Oil Co. 1 Alger Durham, et al, SW SW NW 19-19n-5e; dry in Dundee; TD 3,071 ft.

Kent County, Tyrone Township: Byron MacCallum 1 Arnold Stream, NE NE NW 20-10n-12w; dry in Monroe; TD 2,960 ft.

SPECIFY
SPANG
FOR THE BEST IN CABLE TOOLS
SPANG REGULAR BAILER
(Fig. D380)
SPANG SECTIONAL BAILER
(Fig. D381)
Fig. D380
Fig. D381
Spang Bailers are made with seamless tubes and forged steel bails, darts, and bottoms. The tube is welded securely to the bail and to the bottom, thus insuring long life without leakage.
For the best in Cable Tools
SPECIFY SPANG
THE HIGHER STANDARD
SPANG & CO.
BUTLER, PA.
YOUR DEALER SELLS SPANG TOOLS

N. CENTRAL TEXAS

South Grayson County Gets Wildcat Test

WICHITA FALLS.—Humble Oil & Refining Co. will drill a rank wildcat 3 miles northwest of Gunter in Grayson County. It is 1 J. E. Fallon, 142 ft. from the north line and 660 ft. from the west line of W. H. Trolinger Survey, Abstract 1281. It is contracted to drill to 7,000 ft. Standard Oil Co. of Texas 1 A. J. Mitchell, J. B. McNair Survey, Ellenburger wildcat 1½ miles northwest of Sherman, Grayson County, was drilling below 11,064 ft. in shale, after several cores were taken. The core from 10,997-11,002 ft. recovered 3 ft. of sand and shale with odor of oil. Core from 11,002-005 ft. returned 6 in. of hard sand. Denver Producing & Refining Co. 1 Rich, I&GN Survey, Abstract 1439, proposed 10,000-ft. wildcat 7½ miles northwest of Gordonville, Grayson County, was drilling below 9,020 ft. in hard sand.

Continental Oil Co. 1 C. E. Crump, Block 45, Grayson County School Land, Clay County wildcat 1½ miles northeast of Blue Grove, made a 5-minute drill-stem test from 5,893-5,903 ft. and returned 30 ft. of rotary mud, slightly gas-cut. It drilled in broken lime and shale to 5,913 ft. and will run another drill-stem test from 5,895-5,913 ft. The Caddo, topped at 5,701 ft., was dry. Texola Drilling Co. 1 Levy, C. K. Simmons Survey, Abstract 391, Archer County wildcat 3 miles southeast of Archer City, logged Caddo lime showing oil from 4,844-96 ft. Caddo was topped at 4,844 ft. On a 45-minute drill-stem test 250 ft. of gas-cut mud was recovered. Operator was drilling below 5,061 ft. in shale and black lime.

Electra field, Wichita County, had two completions this week, and National field, Wilbarger County; Madden field, Wichita County; Sivell's Bend field, Cooke County; Hull-Silk field, Archer County, and Ross field, Clay County, each had one. National field had three locations, and Holliday field, Archer County, and Electra field, each had two. National field has seven drilling wells; Rose field, Haskell County, five; Wilson field, Cooke County, and Cooper field, Archer County, each four, and Knox and Cope fields, Young County, each had three.

In West Central Texas, Silver Valley field, Coleman County, had three completions. Silver Valley field had two locations and Neianda field, Jones County; Jones County Regular field, Manning-O'Connor field, Stephens County, and Reddin field, Taylor County, each had one. Eolian field, Stephens County, has five drilling wells;

Eastland County Regular field, four; Lewis Steffins field, Jones County, three and Cisco field, Eastland County, two.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Cooke County: Sun 1 Cason Unit. J. L. Hodges Survey, 1 mi. N Burns City, dry, TD 4,350 ft.

Anderson Drlg. Co. 2 E. S. Ramsey, B. Lusk Sur., 2 mi. W and 1 mi. N Marysville, elev. 866 ft., dry, TD 1,425 ft.

Geo. W. Graham 1 R. Berry, T. B. Hardwick Sur. A-1599, 1½ mi. N and ¼ mi. E. Rosston, Ellenburger 5,656 ft., dry, TD 6,018 ft.

Sunray 1 T.C.U., Phillips Lynn Sur. A-1407, 1 mi. W and 4 mi. S Muenster, Ellenburger 2,364 ft., dry, TD 2,466 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Shackelford County: New pool—Roeser & Pendleton, Inc. 1 T. W. Lee, Sec. 27, Blk. 11, T&P Sur., 2 mi. SW Albany, elev. 1,629 ft., pumped 7 bbl. day through open 2-in. tubing, perf. 4,458-78 ft. Caddo, gravity 40°, TD 4,874 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Eastland County: Texas Pacific Coal & Oil 1 G. W. Gibson, J. W. Copes Sur., 6 mi. SE Ranger, elev. 1,179 ft., Marble Falls 2,780 ft., dry in Caddo, TD 3,330 ft.

Stephens County: Sinclair Prairie 1 Tipton, Sec. 2960, TE&L Sur., 10 mi. W Wayland, elev. 1,263 ft., Ellenburger 4,055 ft., dry, TD 4,164 ft.

Taylor County: Hedrick Oil Co. 1 J. W. Teaff, Subd. 14, Grimes CSL No. 124, 2½ mi. NE Merkel, elev. 1,825 ft., Gunsight 2,787 ft., dry, TD 2,810 ft.

ROCKY MOUNTAIN

Exploration of Bowdoin Structure Gets Under Way

DENVER.—One of the most important exploration campaigns in recent Montana history which has been in the making for the past 2 years was launched this week with the relase by The Texas Co. of a location for the first of a series of three deep tests to be drilled on the Bowdoin structure in Phillips and Valley counties, north central part of the state.

Gas was discovered on the structure in 1912, and on January 1, 1946, there were 212 wells on production from the Bowdoin and Phillips sand. The first named occurs about 450 ft. below the Colorado shale, and is encountered in the field at an average depth of 740 ft. The top of the Phillips sand lies approximately 600 ft. below the Bowdoin sand. The Montana-Dakota Utilities Co. has been the principal operator in the field. In February 1942 a unit agreement for the operation of the upper gas sands was approved with the Fidelity Gas Co., a subsidiary, as the unit operator. The unitized area comprises around 150,000 acres, probably the largest unitized gas field in the country. The structure, which is almost oval in shape, is approximately 66 miles long and 62 miles wide. One deep test was drilled in the field a number of years ago, and was reported to have found water at the top of the Madison. However, it is questioned whether this test ever reached that horizon.

The Texas Co. has acquired the deep sand rights on a 50-50 basis with Montana-Dakota Utilities on approximately 150,000 acres in the unitized area, and has leases on an additional 150,000 acres outside of the Unit, a total of about 300,000 acres. The first test, 1-822 Bowdoin Unit, SW SW 8-32n-32e, is near the top of the structure. It will test all potential horizons down to the granite. Owing to the size of the structure, two additional tests will later be drilled farther out from the top. The first location is approximately 150 miles east of the same company's test in Liberty County which has made a gas and possibly an oil discovery in the Devonian formation and is still drilling and testing.

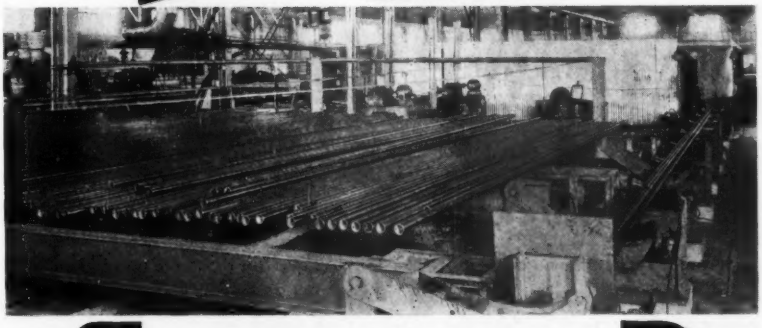
The lease play which has been under way for some time in antiicipation of this development is very extensive and at least 500,000 acres have been blocked up altogether. One trend is to the northwest principally in Townships 34n to 37n and Ranges 31e and 32e. J. M. Huber & Co., H. L. Hunt, of the Hunt Oil Co., Carter Oil Co., Devonian Oil Co., and Sunray Oil Co. are the principal holders of leases on the northwest flank. On this same trend across the Canadian line in Saskatchewan Province, McCall-Frontenac Oil Co., a Texas Co. subsidiary, has filed on 241,760 acres in a block approximately 24 miles wide at the Montana-Canadian line and extending 18 miles north. On the southeast flank of the Bowdoin structure, the Gulf Oil Corp. has two blocks and J. M. Huber & Co. have a block in between. These blocks are in Townships 30n and 31n, Ranges 36e to 38e.

Ules test through Madison.—Stanolind Oil & Gas Co. 1 Madison, NW SW SE 22-4n-92w, deep test to the Madison, is reported to have passed out of that formation at 7,480 ft. It then plugged back from 7,487 ft., total depth, to 4,619 ft. to test shows in the Weber, topped at 4,572 ft.

Sheldon Dome test.—Kerlyn Oil Co., joint with Carter Oil Co., 1 Tribal, NE NE 16-5n-2w, Sheldon Dome, Fremont County, Wyoming, a discovery in the upper Embar in September 1945, which made 468 bbl. of 36.2°-gravity crude in 11 hours, is preparing for additional testing. Of three saturated zones in the Embar, only one zone was tested at the time. Zone at 6,265-80 ft.

HILL, HUBBELL PRECISION HANDLED

STEEL PIPE PROTECTION



Simplified production handling of Steel Pipe at our plants is an important factor in time economy. The precision movement of the pipe by conveyor system, starting with mechanical cleaning, through machine priming—multicoating—and—wrapping, is an uninterrupted process.

Your order, regardless of size, receives prompt attention in its respective scheduling.

You can depend on HILL, HUBBELL pipe protection arriving at destination in excellent condition.

GENERAL PAINT CORPORATION

HILL, HUBBELL & CO. • Division • Cleveland, Ohio

• EXPORT OFFICE: SAN FRANCISCO, CALIFORNIA, U. S. A. •

ALL-WHEEL-DRIVE CONVERTED FORDS . . .

THE LOW-COST ANSWER TO TOUGH TRUCKING PROBLEMS

Marmon-Herrington converted Ford trucks put the many and truly great advantages of *All-Wheel-Drive* power and traction within the reach of all truck operators . . . *at practical low cost.*

For more than a decade, Marmon-Herrington *All-Wheel-Drive* converted Fords have been demonstrating their extraordinary ability to transport peak payloads at rock-bottom cost—*regardless of weather or terrain—on the highway or off.* With live power and traction in *every* wheel—*front wheels pulling, rear wheels pushing*—these great sure-footed trucks are complete masters of every operating condition—deepest mud, sand or snow, steepest hills and grades.

Marmon-Herrington converts all standard Ford models to *All-Wheel-Drive*—passenger cars, station wagons and pick-ups converted to four-wheel-drive; larger truck models converted to four- and six-wheel-drive. These vehicles represent the best engineering skill of the world's greatest automotive producer, plus the highly specialized abilities of the Marmon-Herrington organization—long famous in the development of high-traction, multiple-wheel-drive vehicles for the most severe on- and off-the-road service.

Complete information on Marmon-Herrington Ford conversions and Heavy-Duty *All-Wheel-Drive* trucks is available at world-wide Marmon-Herrington dealer establishments, or from the factory direct.

MARMON-HERRINGTON COMPANY, INC. • INDIANAPOLIS 7, INDIANA

MARMON-HERRINGTON ALL-WHEEL-DRIVE

has been squeezed off through perforation and casing is being perforated at 6,310-50 ft.

Big Sand Draw.—Sinclair-Wyoming Oil Co. 3 Sand Draw Unit, SE SE 10-32n-95w, Big Sand Draw field, Fremont County, Wyoming, which had a blowout in the top of the Embar at 6,645 ft., estimated at 25,000,000 cu. ft. of gas per day, is testing that horizon preliminary to a decision whether to complete at present depth or continue to the Tensleep. The well ran 312 ft. higher on the Embar than the discovery well ½ mile to the southeast, and approximately 100 ft. higher on the Tensleep, showing a considerable thickening of the Embar zone. A drill-stem test through perforations at 7,017-7,105 ft., open 5 hours, showed a recovery of 620 ft. of oil and 800 ft. of oil-cut mud, corrected gravity of oil is 36.4°. Another test at 6,625-6,825 ft., open 11 hours, tested at the rate of 4,000,000 cu. ft. of gas per day and 2½ bbl. of 53°-gravity distillate per hour through a ¼-in. choke, with 20 psi. separator pressure and 50 psi. tubing pressure. Next test will be through perforations at 6,588-6,625 ft.

New operations.—Seventeen new operations were reported, of which 3 were in Colorado, 4 in Wyoming, and 10 in Montana. Seven of the 17 were wildcats. Two of the Colorado locations were in the Rangely field, both outposts on the southwest side. Newton Oil Co. et al 1 Associated, NE SW NE 4-1n-102w, is ½ mile northwest of same interests 1-D Government, which was abandoned after hitting a fault and finding water in the Weber sand. The other is United Oil Producing Co. 1 Government, NW SW 5-1n-102w. This will be a joint operation, the other party to the agreement not being announced at present. It is on a 160-acre tract, the upper half of which is within the known producing limits as designated by the U. S. Geological Survey.

WYOMING WILDCAT FAILURE

Squaw Creek, Fremont County: Fuerst Oil Co. 1 Cooley, SW SE SE 29-33n-100w, dry, TD 1,201 ft., Tensleep 370 ft.

CALIFORNIA

South Belridge Deep Tests Continue to Hold Interest

LOS ANGELES.—Although operators are disclosing no detailed information on the closely watched efforts to develop deep production at South Belridge in Kern County reports last week became more frequent that "results of coring are quite encouraging."

Consequently, interest remained centered on Belridge Oil Co. 62-W-33 which was reported "spot coring" below 13,234 ft. First reports that sand showing oil had been cored in the Belridge well originated 3 or 4 weeks ago when drilling had progressed to around 12,000 ft. Interest subsided somewhat as operators decided to carry the hole to greater depth.

Evidence that deeper-pay prospects are bright at South Belridge was given 2 weeks ago when Richfield Oil Corp. started operations on 1 Berry, 30-28s-21e, approximately 2 miles northwest of the Belridge Oil Co. prospect.

Seaboard Oil Co. has started making new hole in 73-14 Swum, the high-regarded 5 Temblor, an inside location in 17-29s-21e, after drilling by the lower part of an obstruction. Drilling progressed this week at 11,500 ft., indicating that a verdict will be reached in a short time.

An exceptionally thick sand section was reported in Independent Exploration Co. 5 Temblor, an inside location in 17-29s-21e, Kern County. Top of Carneros sand was logged at 2,814 ft. and it was continuous to 2,993 ft. Operators have set 7-in. pipe at 3,025 ft. In addition to thickness of the sand section, the pay in 5 Temblor is significant because it was found lower than in nearby producing wells.

Another wildcat to depth was started last week in Fresno County by Superior Oil Co. which will drill 1 K.C.D., 330 ft. south and west from the east quarter section, 13-17s-16w, about midway between Helm and the Turk anticline.

One of the most significant developments of the week was announcement of more than 30 new drilling contracts awarded by operators holding leases along the shoreline of Los Angeles Harbor within probable productive limits of Zone 237 at the Wilmington field. Long Beach Oil Development Co. awarded contracts for 24 of the new wells and Continental Southern Corp. and Continental Northern Corp. is pouring foundations and preparing locations for several additional wells along the drainage channel. Other operators in the area are moving with dispatch to develop properties to the deeper Zone 237 and the conglomerate-schist pay.

There were 46 new operations announced in California last week. Concentrations of work were reported for Wilmington, Cymric and Paloma each of which received three or more locations. Other new wells were widely scattered.

CALIFORNIA WILDCAT FAILURES

Los Angeles County, Leffingwell area: Rothschild Oil Co. 1 E.S.F.S. Community, 10-3s-11w, dry, TD 5,788 ft. (Couldn't recover fish).

Fresno County, Jacalitos area: Standard of California 41-28e Pauson, 28-21s-15e, dry, TD 5,010 ft., top Kreyenhagen 3,963 ft., Eocene sand 4,740 ft. and Cretaceous 4,965 ft.

KANSAS

Viola Discovery in Paden Pool Pumps 232 Bbl.

ANDERSON - PRICHARD OIL CO. 5 Schultz, NE NW NW 15-18-1w, Viola lime discovery well in the Paden pool of northeastern McPherson County, pumped 232 bbl. of oil daily on state potential test during the past week. The Viola was topped at 3,151 ft. and drilled to 3,156 ft., and the formation was treated with a total of 1,500 gal. of acid. The same company's 6 Schultz, SW SW NW 15-18-1w, encountered the Viola at 3,183-89 ft., total depth, and swabbed 25 bbl. of oil in 6 hours following an acid treatment of 500 gal. Other wells in the pool are producing from the chat.

Biggest disappointment of the week came from Pawnee County where the Magnolia Petroleum Co. completed two failures in the new Rutherford pool. The dry holes were the 1 Sharp, NE NE SW 8-20-16w, ¼ mile south of the discovery well, and the 1-A Rutherford, NE SW NW 8-20-16w, one location southwest of the discovery well. Both tests were lower structurally on the Arbuckle than the discovery well and failed to recover any oil.

Stafford County definitely is getting a new oil pool at the Virginia Drilling Co. 2 Roberts, SW SW 14-21-12w, 2½ miles northeast of the Mueller pool. Latest reports indicated that the well was swabbing at the rate of 7 bbl. an hour from the Arbuckle lime topped at 3,546 ft. The well was drilled to a total depth of 3,584 ft. and treated with 1,000 gal. of acid.

KANSAS SUCCESSFUL WILDCATS

Ellis County: B & R Drilling Co. 1 Henderson, C E/2 SE NE 22-11s-18w, pumped 205 bbl. of oil per day from Arbuckle at 3,634-36 ft., gravity 22°, anhydrite 1,057 ft., Lansing-Kansas City 3,324 ft., conglomerate 3,580 ft., Simpson dolomite 3,616 ft., TD 3,636 ft.

Pawnee County: Ben F. Brack & J. M. Huber Corp. 1 Lucy Rutherford, SW NE NW 8-20s-16w, pumped 128 bbl. of oil per day from Arbuckle at 2,817-23 ft., gravity 41.4°, annydrite 1,082 ft., Topeka 3,160 ft., Heebner 3,426 ft., Basal Oread 3,455 ft., brown lime 3,492 ft., Lansing-Kansas City 3,502 ft., Marmaton chert 3,779 ft., TD 3,823 ft.

KANSAS WILDCAT FAILURES

Cowley County: B. B. Blair 1 Pauley, NE NE NE 23-33s-3e, dry, TD 3,340 ft., Layton 2,611 ft., Kansas City 2,810 ft., Oswego 3,004 ft., Bartlesville sand 3,319 ft., Mississippi lime 3,322 ft.

Dickinson County: Vickers Petroleum 1 Bozarth, NE NE NW 3-16s-1e, dry, TD 3,350 ft., Kansas City 1,913 ft., Mississippi lime 2,558 ft., Kinderhook 2,754 ft., Misener sand 2,889 ft., Hunton 2,904 ft., Sylvan shale 3,044 ft., Viola 3,150 ft., Simpson 3,242 ft., Arbuckle 3,305 ft.

Pratt County: Pulse-Hershfield Drilling Co. 1 M. Block, SE NE NW 6-26s-11w, dry, TD 4,328 ft., Lansing-Kansas City 3,580 ft., Mississippi lime 3,939 ft., Kinderhook 4,092 ft., Viola 4,108 ft., Simpson 4,187 ft., Arbuckle 4,291 ft.

Stanolind Oil & Gas Co. 1 Hiskett, SE SE NW 23-29s-11w, dry, TD 4,790 ft., anhydrite 980 ft., Lansing-Kansas City 3,783 ft., Mississippi lime 4,319 ft., Viola 4,577 ft., Simpson 4,650 ft., Arbuckle 4,743 ft.

Seward County: H. L. Hunt 1 Lofland, C S/2 SE NW 18-35s-31w, dry, TD 8,006 ft., Hollenberg 2,570 ft., Winfield 2,685 ft., Basal Florence 2,980 ft., Lansing-Kansas City 4,478 ft., Mississippi lime 6,230 ft., Maquoketa 7,780 ft., Simpson 7,985 ft.

Sumner County: Fred Morgan 1 Horsley, C E/2 SE SW 18-35s-1e, dry, TD 3,894 ft., Mississippi lime 3,612 ft., Simpson 3,880 ft.

Trego County: Republic Natural Gas Co. 1 R. Hille, SW SW NE 13-15s-24w, dry, TD 4,258 ft., anhydrite 1,645 ft., Topeka 3,327 ft., Heebner 3,581 ft., Lansing-Kansas City 3,595 ft., Fort Scott 4,100 ft., conglomerate 4,181 ft., Mississippi lime 4,206 ft.

Sohio Oil et al 1 Pfaff, SE SE SE 14-15s-23w, dry, TD 4,650 ft., anhydrite 1,710 ft., Lansing-Kansas City 3,728 ft., cherty conglomerate 4,289 ft., Mississippi lime 4,298 ft., Viola 4,454 ft., Arbuckle 4,585 ft.

OKLAHOMA

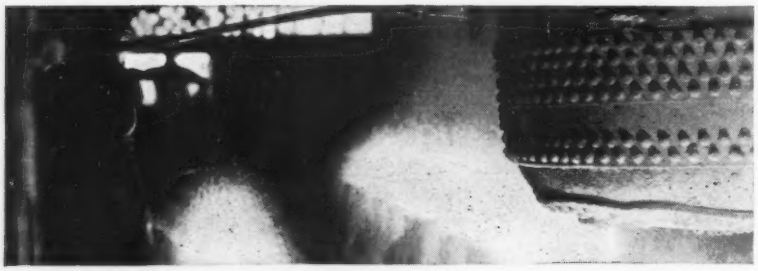
Chitwood Extension Flows 500 Bbl. in 16 Hours

MAGNOLIA PETROLEUM CO. has definitely opened deep oil production and extended the Chitwood gas-distillate field nearly a mile to the northwest at the 1 Speirs, SW SW 28-5n-6w, Grady County. Pipe was perforated at 11,720-36 ft. and the well flowed 500 bbl. of 43.7° gravity oil in 16 hours through open tubing. Through a 10/64-in. choke it flowed 99 bbl. in 6 hours. Gas-oil ratio was reported to be 2,223 to 1; flowing tubing pressure 3,350 lb.; flowing casing pressure 3,550 lb., and shut-in casing pressure 4,475 lb. Bottom-hole pressure and temperature surveys are being run at the present time.

Another Grady County wildcat which created considerable excitement during the past week was the George P. Livermore, Inc., 1 Giles Ranch, NW NW 35-8n-5w, located on the Middleberg high. Operator perforated approximately 100 ft. of the Viola section, ran 7,000 gal. of acid and bailed down to get gas. Excitement started when the gas was erroneously reported to be from 50,000,000 to 100,000,000 cu. ft. daily. Later reliable reports, however, stated that the gas flow was only 50,000 to 100,000 cu. ft. daily. Operator is now considering further tests of the Viola, and may later test the Hunton and some of the Pennsylvanian sands encountered in earlier drilling.

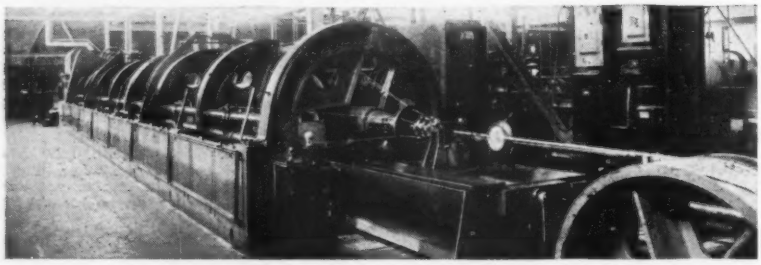
A Major County wildcat, Wilcox Oil Co. et al 1 Coulter, 15-22n-9w, encoun-

FROM THE MAKING OF THE STEEL—



THROUGH PROCESSING THE WIRE—

TO FABRICATING THE WIRE ROPE—



WICKWIRE SPENCER WIRE ROPE

is safeguarded by continued, careful control to assure the utmost in performance, safety and long life. Wickwire Spencer Wire Rope is available in all sizes and constructions—both regular lay and WISSCOLAY *Pre*formed.

HOW TO PROLONG ROPE LIFE AND LESSEN ROPE COSTS...

Thousands of wire rope users—old hands and new—have found "Know Your Ropes" of inestimable value in lengthening life of wire rope. Contains 78 "right and wrong" illustrations, 41 wire rope life savers, 20 diagrams, tables, graphs and charts. For your FREE copy, write

Wire Rope General Sales Office, Palmer, Mass.

WICKWIRE SPENCER STEEL DIVISION
The Colorado Fuel and Iron Corporation
THE CALIFORNIA WIRE CLOTH CORPORATION

EASTERN GENERAL SALES OFFICE 501 Delaware Ave., Buffalo 2, N. Y. | EXECUTIVE OFFICES DENVER 2, COLORADO | WEST COAST OFFICES OAKLAND 4, CALIFORNIA | KEY CITY OFFICES SEE PHONE BOOK

tered a slight show of gas in the Hunton lime at the close of the week. The Hunton was topped at 7,590 ft. and a core from 7,499-7,510 ft. recovered 3 ft. of cherty dolomite with oil stains and gas odor. A drill-stem test at 7,487-7,510 ft. recovered 394 ft. of gas-cut mud and no oil. Drilling was resumed and is now progressing below 7,550 ft.

OKLAHOMA SUCCESSFUL WILDCAT

Beckham County: Stephens Petroleum et al 1 J. J. Pennington, NW NW NW 27-8n-25w, flowed 936,000 cu. ft. of gas per day from dolomite at 1,950-2,084 ft., discovery well, granite 2,394 ft., TD 2,402 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Bridwell Oil Co. 1 Neal Halsey, SW SE NW 30-3s-10w, dry, TD 3,150 ft., Canyon 2,610 ft., Ellenburger 2,978 ft.

Grant County: W. J. Sherry et al 1 Staggers, NE SW SW 4-25n-3w, dry, TD 5,414 ft., Herrington 950 ft., Pawhuska 2,210 ft., Tonkawa 3,360 ft., Perry gas sand 3,540 ft., Woodford 5,235 ft., Misener 5,291 ft., Wilcox 5,323 ft., second Wilcox 5,375 ft.

McClain County: Carter Oil Co. 1 Boone Mitchell, C SE NE 29-8n-3w, dry, TD 10,211 ft., Oread 5,315 ft., Hogshooter 6,990 ft., Deese sand 8,938 ft., with stain and odor of oil, Woodford 9,765 ft., Hunton 9,916 ft.

Noble County: Davon 1 Tom Buffalo Head, NW NW NW 7-24n-4e, dry, TD 4,014 ft., Oread 1,795 ft., Hogshooter 2,210 ft., Oswego 3,140 ft., Mississippi lime 3,655 ft., Simpson 3,965 ft., second Wilcox 3,980 ft.

Pontotoc County: Blackwell Oil & Gas Co. 1 Smith, SE SW NW 29-4n-8e, dry, TD 3,022 ft., Boggy 630 ft., McAlester 1,501 ft., Atoka 1,820 ft., sand 2,713 ft., Wapanucka 2,720 ft., Union Valley 2,993 ft., Cromwell 2,999 ft.

Stephens County: Mid-Continent Petroleum Corp. 1 Land Bank, NE SW SE 35-2s-7w, dry, TD 4,600 ft., Pennsylvanian sands between 2,800-3,000 ft., Arbuckle 4,388 ft.

MISSISSIPPI

Mississippi Activity Continues at High Rate

JACKSON. — Projected exploratory and drilling activity of the major fields in Mississippi continued to run high this week, climaxed by productive shows in several wells.

In Marion County, Humble Oil & Refining Co. 4 E. A. Ball, 20-2n-14e, may prove to be the sixth producing well for Hub field with 30 ft. of gas sand shown in the cored interval 9,040-9,119 ft. and oil sand from 9,119-25 ft. The company's Fayette field completion, B-2 Mrs. A. M. Stewart, 27-9n-1w, Jefferson County, flowed 108 bbl. of oil per day through ⅛-in. tubing choke, 37.8° gravity, from Massive sand at 9,638-50 ft.

In Eucutta field, Wayne County, Gulf Refining Co. 1 Masonite-Leggett Unit, 26-10n-9w, is installing pump after perforating and swabbing 3 bbl. of oil per hour. Gulf is also preparing to install pump at 1 McDonald-James Unit, Section 35-1n-12e of Jasper County in West Heidleberg field, after swabbing approximately 2 bbl. of oil per hour.

This week's new locations include Gulf Refining Co. et al 1 J. Q. Butler, 32-2n-16w, Lamar County, which will represent a northeast extension to the company's 2 J. M. Andrews if it should prove productive; The California Co. 1 Lincoln County Board of Supervisors, 16-6n-8e, Lincoln County, an east offset to the recently completed 1 Mary Parnell McDaniel.

LA.-ARK.

Bossier Wildcat Has Small Gas Show

SHREVEPORT. — Barnsdall Oil Co. and Sohio Petroleum Co.'s north Bossier wildcat, the 1 Carter-Burton in 26-23n-13w, was opened for 3½ hours last week, with tools in a sand at 8,950-75 ft., and gas flowed at an indicated 37,000 cu. ft. daily. Operators were said to be plugging back to test the Travis Peak at 7,090-7,100 ft. Location is about 4 miles west of the Carterville gas area.

In the Longwood oil pool, northern Caddo Parish, Joe Burnham's 1 Noel, 11-19n-16w, was reported to be 52 ft. high on the base of the Massive anhydrite, as correlated with Union Producing Co.'s 1 Noel. Burnham's test had an elevation of 294 ft. and found the massive at 4,464 ft., while Union's well, elevation 320 ft., found the same formation at 4,542 ft.

NORTH LOUISIANA WILDCAT FAILURE

Natchitoches County: H. J. Schmidt et al 1 B. Smith, C SW NE SW 33-9n-9w, dry, TD 7,514 ft.

ILLINOIS

Devonian May Produce Commercially at Mattoon

MATTOON.—Outstanding development in the Illinois basin during the past week was the finding of what appears to be the first commercial Devonian lime saturation in the Mattoon field of Coles County. The National Consumers Oil Co. 2 M. B. Herkimer, SW NW NE 11-12n-7e, recovered gas in 30 seconds and a spray of oil in 25 minutes on a 1-hour drill-stem test of that formation at 3,152-65 ft. Other Devonian tests in this field have found oil and gas but none so far has been able to produce commercially. For additional information concerning this test see "Week's Highlights," page 141 of this issue.

The Herald pool of White and Gallatin counties is being extended approximately ½ mile to the east by Oil Management, Inc. 1 Leach et al, NW NE SW 14-7s-9e. On a swab test of the Aux Vases sand at 2,863-68 ft. this well made 135 bbl. of oil in 24 hours, natural. Total depth is 2,882 ft. and pumping unit is being installed for production tests.

Results of a drill-stem test taken during the past week at the Joe Reznik et al 1 Arnold Valter, S½ SE NE 3-9s-9e, indicate that a new pool may be opened soon in Gallatin County. The drill-stem test, of 1 hour duration, was made on the Aux Vases at 2,726-34 ft. and recovered gas in 28 minutes, 240 ft. of clean oil and 60 ft. of oil-cut mud. Casing has been set at 2,720 ft., preparatory to further testing. The Valter is about midway between the Inman and Junction pools and is about 4 miles north of the Shawneetown field, which is the most southerly producing field in the state at the present time.

Illinois completions showed a continued upward trend last week with 44 wells finaled. Of these 27 were oil wells and 17 were dry, including 1 successful and 3 dry wildcats. First reports totaled 60 and included 14 exploratory tests which were scattered throughout the basin area.

ILLINOIS SUCCESSFUL WILDCAT

Shelby County: Sohio Petroleum Co. 1 Flenner, SE NE NW 17-10n-4e, pumped 12 bbl. oil, Benoist sand 1,774-88 ft., TD.

ILLINOIS WILDCAT FAILURES

Bond County: Sohio Petroleum Co. 1 Mahne, NW SE SE 14-6n-5w, dry, TD. 2,668 ft., Devonian 1,840 ft., Trenton 2,610 ft.

Clay County: Ashland Oil & Ref. 1 Nadler, SW SW NE 1-5n-6e, dry, TD 3,025 ft., Ste. Genevieve 2,755 ft., McClosky 2,832 ft., with show of oil.

Coles County: F. D. Walker 1 Browne, NW SE SE 36-14n-7e, dry, TD 1,900 ft., Ste. Genevieve 1,836 ft., McClosky 1,890 ft.

Hamilton County: Claude Neon Light 1 Wilson, NE SE SW 30-6s-6e, dry, TD 3,210 ft., Benoist sand 3,115 ft., Aux Vases 3,180 ft.

Marion County: Sohio Petroleum Co. 1 R. W. Hawkins, SE SE NW 29-1n-4e, dry, TD 2,931 ft., McClosky 2,877 ft.

Perry County: E. M. Self 1 Kirkpatrick, NW NW SW 30-4s-1w, dry, TD 1,310 ft., Cypress 1,127 ft., Benoist 1,289 ft.

Richland County: Fleming & Swan 1-A Reed, SW SE NE 27-3n-10e, dry, TD 3,336 ft., Cypress 2,924 ft., Aux Vases 3,120 ft., McClosky 3,232 ft.

Shelby County: C. E. Hance 1 Geisler, NE NE SE 19-10n-5e, dry, TD 1,964 ft., Cypress 1,743 ft., Aux Vases 1,941 ft.

M. E. McKittrick 1 Lewis, NE SE SE 30-10n-4e, dry, TD 1,916 ft., Cypress 1,641 ft., Aux Vases 1,868 ft., McClosky 1,904 ft.

Wabash County: George & Wrather 1 Gilkison, NW NE SW 36-1s-14w, dry, TD 3,000 ft., Cypress 2,745 ft., Aux Vases 2,876 ft., McClosky 2,939 ft..

Continental Oil 1 Stetzer, NE NW NW 36-1s-13w, dry, TD 2,014 ft., Menard 1,977 ft., Waltersburg 1,986 ft.

White County: R. Halbert 1 Mills, NE SW NW 36-6s-8e, dry, TD 3,137 ft., Cypress 2,682 ft., Aux Vases 2,942 ft., McClosky 3,053 ft.

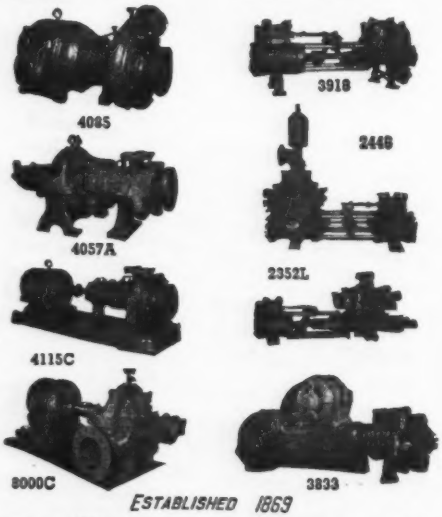
PROTECT
VALUABLE TOOLS
FROM THEFT
AND WEATHER
ALLIED STEEL
ALLIED STEEL TOOL HOUSES are designed and built for years of trouble-free service. Measure 7 feet x 12 feet x 7 feet. Built entirely of steel. Equipped with burglar proof door, ventilators, electric connections and fixture. Complete with hangers, shelves and record desk. Towing lugs and mounted on skids. Special sizes and interior arrangements may be furnished.
Write for Details
ALLIED STEEL PRODUCTS CORP.
2100 NO. LEWIS
TULSA, OKLAHOMA

SUMMARY OF JULY COMPLETIONS

	Comp.	Oil	Prod.	Gas	Dry	Under 1,000 ft.	1,000-2,500 ft.	2,500-5,000 ft.	5,000-10,000 ft.	Over 10,000 ft.	Total footage	Rigs and drilling
New York	121	63	189	0	*58	0	121	0	0	0	170,963	152
Pennsylvania	293	164	412	6	†123	21	251	21	0	0	432,164	253
West Virginia	58	17	288	26	15	7	29	19	3	0	145,257	227
Ohio	101	23	349	45	33	19	25	57	0	0	265,543	231
Indiana	50	22	2,059	1	27	2	33	15	0	0	105,513	68
Kentucky	45	16	1,349	16	‡13	9	22	14	0	0	83,151	72
Illinois	193	112	12,025	0	81	8	79	106	0	0	593,984	241
Michigan	63	22	2,652	3	38	0	34	28	1	0	148,564	114
Kansas	157	89	33,571	19	§49	0	15	142	0	0	499,369	281
Neb., Mo., Iowa	0	0	0	0	0	0	0	0	0	0	0	11
Oklahoma	278	126	11,668	62	§90	8	75	156	37	2	905,974	404
Texas	603	351	86,552	45	207	32	132	233	192	14	2,653,996	891
North	179	99	21,671	2	78	28	76	51	24	0	482,233	155
West Central	46	18	4,298	3	25	1	15	29	1	0	133,691	65
West	131	107	42,086	0	24	1	19	58	45	8	672,123	278
Panhandle	20	5	571	11	4	0	2	18	0	0	58,117	78
Eastern	37	18	3,225	11	8	0	5	14	17	1	203,881	125
Upper Gulf Coast	51	26	3,301	3	22	0	2	22	24	3	348,958	74
Lower Gulf Coast	85	64	8,999	12	9	0	0	13	70	2	554,581	77
South	41	10	2,068	2	29	0	9	23	9	0	157,193	21
South Central	13	4	333	1	8	2	4	5	2	0	43,219	18
Louisiana	93	53	8,684	7	33	0	13	32	28	20	562,125	186
Northern	55	31	5,027	6	18	0	12	29	12	2	224,648	93
Southern	38	22	3,657	1	15	0	1	3	16	18	337,477	93
Arkansas	12	6	971	1	5	0	1	6	5	0	54,659	26
Mississippi	14	5	1,228	1	8	0	0	3	8	3	101,488	45
Ala., Ga., Florida	4	0	0	0	4	0	0	1	2	1	29,647	18
Montana	24	13	1,236	6	5	4	13	7	0	0	45,195	77
Wyoming	14	11	2,775	0	3	2	0	8	2	2	72,475	72
Colorado	11	9	3,525	0	2	0	1	0	10	0	64,620	69
New Mexico	24	16	4,033	2	6	0	6	12	5	1	92,128	110
California	158	123	44,090	6	29	6	35	62	49	6	692,584	184
Total July	2,316	1,241	217,706	246	829	118	885	922	342	49	7,719,399	3,732
Total June	2,536	1,396	279,029	239	901	160	1,046	899	371	60	8,354,005	3,870

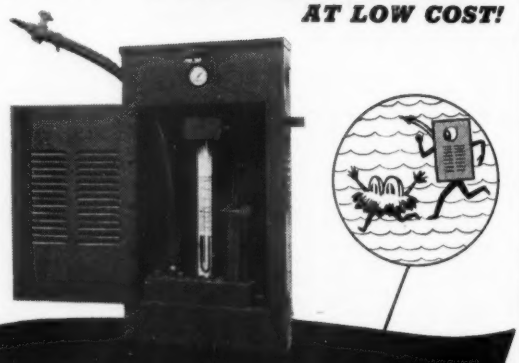
Service wells, four weeks ending July 27, 1946: *58, †123, ‡1, §3.

PUMPS
CENTRIFUGAL
RECIPROCATING
BUILDERS OF OUTSTANDING PUMPS
Since 1869



ESTABLISHED 1869
DEAN BROTHERS PUMPS INC.
INDIANAPOLIS IND.
323 W TENTH ST.

High Capacity PADDOCK CHLORINATOR
AT LOW COST!



FOR ALGAE CONTROL

The portable PADDOCK CHLORINATOR is the safe, inexpensive way of introducing chlorine in water . . . the sure method of eliminating costly algae in cooling towers and pipe lines. Simplified construction means . . . greater efficiency . . . lower cost. To solve your problem write today for details.

Paddock Engineering Co., of Texas
900 SOUTH ERVAY DALLAS 1, TEXAS

OHIO, KENTUCKY

Muskingum County Wildcat Gets 400,000 Cu. Ft. Gas

COLUMBUS.—The Ohio Fuel drilled in their wildcat test in Section 15, Brush Creek Township, Muskingum County, with a gage of 192,000 cu. ft. natural from the Clinton sand at 3,687-3,735 ft. After shot, the well gaged 400,000 cu. ft. An offset well will be drilled to the northeast.

The second large Clinton sand gas well in Section 21, Salt Creek Township, Muskingum County, was completed by the Wasson Co. on R. A. McConaha. Clinton, topped at 4,083 ft., was drilled to 4,110 ft. with a natural gage of 7,000,000 cu. ft.

Nollem O. & G. 4 W. B. Jeffers, Section 33, Orange Township, Meigs County, along the east edge of the Hemlock Grove pool, made 45 bbl. after shot. The well will encourage drilling further to the east.

Of the 24 new locations for the week, Ashland Field reported 7, Cambridge and Sandyville 4 each, Brush Creek 3, and Lancaster, Mt. Vernon and Stewart 2 each. Cambridge field led in completions with 7 out of 27.

OHIO SUCCESSFUL WILDCAT

Muskingum County, Brush Creek Township: Ohio Fuel 1 Estella Buchanan, Sec. 15, Clinton 3,687-3,735 ft., 400,000 cu. ft., TD 3,738 ft.

OHIO WILDCAT FAILURES

Guernsey County, Wheeling Township: Ohio Fuel 1 R. K. Roahrig, Sec. 19, Lime 2,908, Oriskany 3,040, TD 3,073 ft.

WESTERN KENTUCKY

OWENSBORO.—Carter Oil Co. 1 C. Powell, 22-O-23, Henderson County wildcat, pumped 158 bbl. of oil in 13 hours on completion test during the past week. Pay zone was in the Fredonia lime at 2,532-38 ft., total depth 2,705 ft. This well is a short distance west of the Robards pool and may be an extension well of that pool.

Other completions during the week included three oil wells and three dry wildcats. New operations started totaled five, including two wildcats for Daviess County and one field well each for Henderson, Union and Webster counties.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Henderson County: Carter Oil Co. 1 C. Powell, 22-O-23, pumped 158 bbl., Fredonia 2,532-38 ft., TD 2,705 ft.

WESTERN KENTUCKY WILDCAT FAILURES

Henderson County: C. Wood & Thorne Drlg. Co. 2 Cooksey Crafton, 16-Q-25, dry at 2,495 ft.

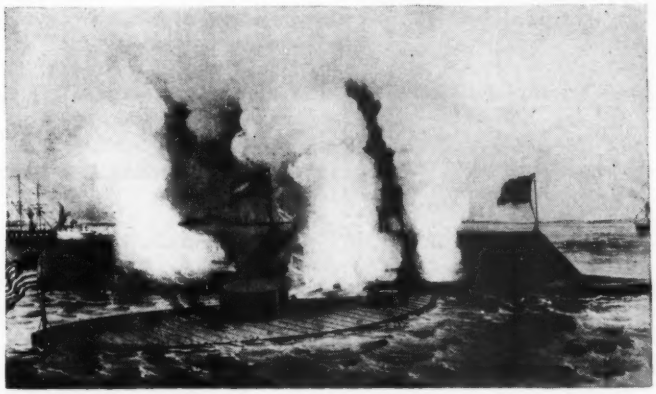
Mead County: Texas Co. 1 Wheley estate, 21-Q-41, dry at 1,985 ft.

Union County: Sinclair Prairie 1 McDonald, 12-P-20, dry at 2,752 ft., Glen Dean 2,020 ft., Cypress 2,262 ft., Ste. Genevieve 2,534 ft., Levias 2,543 ft.

INDIANA

EVANSVILLE.—Continental Oil Co. 1-D Cooper estate, SW SW 13-3s-14w, unsuccessful as a deep test in the Griffin field, has plugged back to 3,265 ft. and is rigging up cable tools to test the St. Louis at 3,142-48 ft. Drilled to a total depth of 6,408 ft. in the Trenton, the well failed to encounter any favorable shows below the St. Louis.

Indiana operators completed four oil wells and two dry holes during the past week. No wildcat completions were reported. Eight new operations were announced during the week, four each for Gibson and Posey counties.



Famous Facts

In March, 1862, the first engagement between the ironclad "Monitor" and "Merrimac" at Hampton Roads opened the era of armored warships in naval warfare. The battle was indecisive, with few casualties on either side, but it proved the practicality of heavily armored ship construction.

During the previous decade, Bitumastic Enamel — the first product in its field — was introduced as a protective coating for interior ship surfaces subject to severe corrosive conditions. Characteristics of Bitumastic Enamel which make it an excellent protective coating for oil, gas and gasoline pipe lines include high viscosity, strong adherence, superior cold flow characteristics and maximum resistance to soil stress. Impervious to water and chemically inert, Bitumastic gives long protection in all soils and climates.

Where cathodic protection is used as an adjunct to Bitumastic Enamel, fewer sacrificial anodes are required and electric current needs are reduced.

WAILES DOVE-HERMISTON
CORPORATION
WESTFIELD, NEW JERSEY

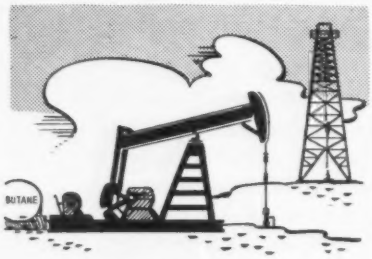
New York 4 • Philadelphia 8 • Cleveland 14 • Chicago 3 • Houston 2 • Tulsa 3
Miami 36 • San Francisco 10 • Los Angeles 1

PENBERTHY
"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO



Less "Down" Time
WITH DELIVERIES ON TIME

BUTANE
PROPANE
DIESEL FUEL

. . . To keep your rigs and pumps going.

ALSO RENTAL TANKS
CALL

R. J. Allison Co.

Falls City, Neb. . . . 807
Stockton, Kan. . . . 335
Stafford, Kan. . . . 480
Great Bend, Kan. . . . 1555
Shawnee, Okla. . . . 586
Duncan, Okla. . . . 2225
Tulsa, Okla. . . . 3-6143
Perry, Okla. . . . 113
Hobbs, N. Mex. . . . 275-R
DAY OR NIGHT

Among the

Drilling Contractors

Olsen-Blount Drilling Corp., Oklahoma City, have finished rigging up derrick and are moving in tools at R. Olsen Oil Co.'s 1 Ott, W½ SW SE 4-21n-9w, Major County, Oklahoma. The wildcat will drill to the Wilcox.

K. L. Kellogg & Sons, Long Beach, is preparing to start five new wells in the Paloma district, Kern County, California.

Gene Reid Drilling Co., Bakersfield, has been awarded contract for five wells in the Cymric area, Kern County, California, to be drilled in Section 22-29s-21e, for Superior Oil Co. Two of the wells will be shallow tests.

Rocky Mountain Drilling Co., Los Angeles, has contracted to drill Richfield Oil Corp. 1 Berry, the projected deep wildcat test to lower potential pays in the South Belridge area, Kern County, California.

Earl Kellogg, president of K. L. Kellogg & Sons, Long Beach contractor, presided at the California chapter meeting, American Association of Oilwell Drilling Contractors, which was held at Bakersfield, Calif., August 15. E. C. Brown, president of the Brown Drilling Co., Long Beach, a contracting firm which is engaged in drilling several wells for Arabian American Oil Co. in Saudi Arabia, was guest speaker.

Jones, Shelburne & Farmer, Inc., Oklahoma City, have contract on two Sohio Petroleum Co. wells in Kansas. Work was under way last week at the 1 Herrman, a wildcat in 9-16-18w, Rush County, about 10 miles north of LaCrosse and 5 miles south of production in Ellis County. The second well is 5-F Bemis, 28-11-17w, in the Bemis pool of Ellis County.

Rhodes Drilling Co. has contract for Skelly Oil Co.'s 2 Huddleston, in Section 11, Block 9, T&P Survey of Fisher County. Derrick was being erected early this week.

Herndon Drilling Co. Tulsa, will drill Sohio Petroleum Co.'s wildcat, 1 Herman, SE SE NW 3-14-16w, in eastern Ellis County, Kansas. Location, which is based on subsurface geology, is ¼ mile west of the town of Walker. Nearest production is the Herzog pool, 1 mile north and 2 miles west.

Rine Drilling Co. has contract for Lion Oil Refining Co.'s 1 Jo, SE SW 33-26-13w, in Pratt County, Kansas. The new test, on the northwest corner of the town of Iuka, is a northeast offset to Lion's discovery, which had oil in the Arbuckle at 4,432-40 ft.

Wheless Drilling Co., Shreveport, was awarded contract for Carter Oil Co.'s Hyrum Moore estate, in SW SE 14-16s-25w, at the new Spirit Lake field of Lafayette County, Arkansas.

Nelson Drilling Co. started drilling last week on an Arbuckle lime test for H. B. Peatling, of Salina, Kans. The wildcat, 1 Quinn, SE SE SE 27-11-2w, Ottawa County, Kansas, is 16 miles north of the Salina pool and

USE 'BESTOLIFE
IT'S BETTER

'BESTOLIFE — the Lead Seal Joint Compound used successfully in the Drilling and Refining Industries for years — is immediately available through more than 100 distributors in the U.S.A. Your nearest supply house field store probably has 'BESTOLIFE in stock for immediate delivery. Use 'BESTOLIFE — it's BETTER!

EXPORT: THE NATIONAL SUPPLY CORP., 30 ROCKEFELLER PLAZA, NEW YORK

I. H. GRANCELL
1601 EAST NADEAU STREET
LOS ANGELES 1, CALIFORNIA

4 miles northeast of the town of Bennington in the southeastern part of the county. The test is based on information gained from several core holes drilled earlier.

Crow Drilling Co. has staked location for Gulf Refining Co.'s 1 John Q. Butler, in SW SE 7-1n-16w, and was building roads for Gulf's 4 Davis, in Section 7, of the Baxterville field, Lamar County, Mississippi.

Crawford Drilling Co. has contract for Gulf Refining Co.'s 3 Johnston et al, in 34-10n-9w, of the Eucutta field, Wayne County, Mississippi. On last report operators were rigging up rotary.

CALENDAR

September

Houston Nomads, Old College Inn, Houston, September 9.

Sixth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., September 9-11

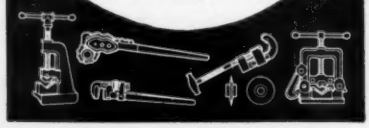
American Chemical Society, semiannual meeting, Chicago, September 9 to 13.

Pacific Coast Gas Association, annual convention, Fairmont Hotel, San Francisco, September 10-12.

Fourth National Chemical Exposition, sponsored by Chicago section, American Chemical Society, Coliseum, Chicago, September 10-14.

"ARMSTRONG BROS." Pipe Vises are built for lifetime service with *unbreakable* drop forged steel hooks. Other design improvements include: oval handle ends (will not pinch hands), replaceable tool steel jaws with milled teeth, and on sizes 70 and 71, a solid 1-piece jaw that prevents kinking of small pipe. There are always extra quality features in an "ARMSTRONG BROS." Pipe Tool.

ARMSTRONG BROS. TOOL CO.
304 N. Francisco Ave., Chicago 12, U.S.A.
Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.



Los Angeles Nomads, Mayfair Hotel, September 11.

Texas Railroad Commission state-wide allowable hearing, Austin, September 13.

National instrument conference, sponsored by Instrument Society of America, William Penn Hotel, Pittsburgh, September 16-20.

National Petroleum Association, forty-fourth annual meeting, Hotel Traymore, Atlantic City, N. J., September 18-20.

Liquefied Petroleum Gas Association, eight-state convention, Oklahoma City, September 18-21.

Oklahoma Utilities Association, gas division, annual fall meeting, Biltmore Hotel, Oklahoma City, September 20.

National Petroleum Council, Washington, September 26.

National Lubricating Grease Institute, fourteenth annual meeting, Edgewater Beach Hotel, Chicago, September 29-October 2.

October

American Association of Oilwell Drilling Contractors, sixth annual meeting, Plaza Hotel, San Antonio, Tex., October 1-2.

American Institute of Mining and Metallurgical Engineers, Petroleum Division, annual meeting, Galvez Hotel, Galveston, Tex., October 3-5.

American Society of Mechanical Engineers, 3-day national conference on petroleum mechanical engineering, Mayo Hotel, October 7-9.

Thirty-fourth National Safety Congress and Exposition, Stevens Hotel, Chicago, October 7-11.

American Gas Association, annual meeting, Atlantic City, October 7-12.

Los Angeles Nomads, Mayfair Hotel, October 9.

California Natural Gasoline Association, twenty-first annual meeting, Ambassador Hotel, Los Angeles, October 11.

Houston Nomads, Old College Inn, Houston, October 14.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 16-18

American Institute of Mining and Metallurgical Engineers, Petroleum Division, annual meeting, Ambassador Hotel, Los Angeles, October 24-25.

American Association of Petroleum Geologists, midyear meeting, Buena Vista Hotel, Biloxi, Miss., October 24-25.

Independent Petroleum Association of America, annual meeting, Fort Worth, October 28-30.

Midwest Gas Association and Iowa State College Gas School and Conference, Ames, Iowa, October 28-30.

November

Los Angeles Nomads, Fall Festival, Mayfair Hotel, Los Angeles, November 2.

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

Houston Nomads, Old College Inn, Houston, November 11.

A.P.I. annual meeting, Stevens Hotel, Chicago, November 11-14.

Los Angeles Nomads, Mayfair Hotel, November 13.

American Society for Metals, annual meeting, and National Metal Exposition, Atlantic City, N. J., November 18-22.

American Welding Society, annual meeting, Atlantic City, N. J., November 18-22.

American Institute of Mining and Metallurgical Engineers, iron and steel division, and institute of metals division, annual fall meeting, Atlantic City, N. J., November 18-22.

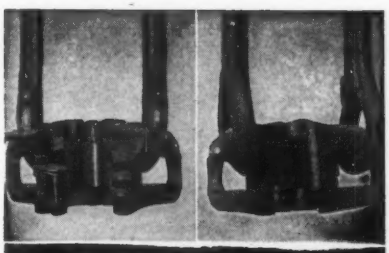
Rocky Mountain Oil and Gas Association, annual meeting, Shirley-Savoy Hotel, Denver, November 21-23.

December

American Society of Mechanical Engineers, New York, December 2-6.

Houston Nomads, Old College Inn, Houston, December 9.

Los Angeles Nomads, Mayfair Hotel, December 11.



In Either Open or Closed Position

BJ "AA" ELEVATORS ARE REALLY BALANCED

By incorporating a newly devised roller type balancing cam in BJ "AA" Elevators the work of the derrick man is made much easier. Rated at 300 tons, with a safety factor of four to one, this elevator is made of high alloy steel—fully heat treated—flame hardened on the top bore to minimize upsetting—and is equipped with an unusually sturdy latch. Ask the BJ man or your supplier.

BYRON JACKSON CO.
Houston • LOS ANGELES • New York

Young
DRILLING ENGINES MAKE FRIENDS FOR **LIFE**

If you have chosen a YOUNG Drilling Engine for the first time today, you can feel sure that the choice was a wise one. A year from today—or ten years from today, when you review your experience with this substantial, trustworthy, and economical machine, you will know how profitable your choice has been. Gas, Gasoline, Butane, or Diesel.

DISTRIBUTORS: A. E. Avers, Box 606, Tulsa, Okla. Iverson Tool Co., Texas, Artesia, New Mexico Branchland Pipe & Supply Co., Huntington, W. Va. Connelly Machy. Co., Billings & Great Falls, Mont.

OTHER YOUNG PRODUCTS
Natural Gas Carburetors • Orifice Gas Well Testers
Under-Road Boring Machines • Electric Light Plants
Hay Dust Sandder

YOUNG ENGINES MAKE YOUR DRILLING DOLLARS GO DEEPER

YOUNG ENGINE CORP.
CANTON, OHIO

PERSONALS

R. C. Brown Began With Mutual Oil 22 Years Ago

R. C. BROWN, who earlier this year became assistant to the manager, Denver region, production and drilling department, Continental Oil Co., has been associated with the Continental organization since 1924.

In that year, Brown went to work for Mutual Oil Co. as a clerk in the warehouse purchasing department in Tulsa. He continued with Continental when Mutual was merged with that company.

In 1929, Brown was transferred to Ponca City, Okla., as a partnership clerk in the production accounting division. Three years later he was promoted to head partnership clerk.

In his position at Denver, he is assistant to J. C. Johnston, regional manager. Brown has been active in Continental employe recreational activities, having served on the board of directors and as president of the Conoco Employes Association.

J. J. Darley has been appointed deputy works manager of Anglo-Iranian Oil Co., Ltd. Other appointments include: **A. W. G. Trantor,** deputy works manager (engineering); **D. N. McKinlay,** assistant works manager (production); **Dr. W. Pratt,** assistant works manager (development); and **W. N. Gemmill,** assistant works manager (engineering). The appointments resulted from the promotion of **K. B. Ross** to works manager succeeding **G. E. Wheeler,** and the transfer of **E. E. Thorneloe** to a senior engineering position in the fields area.

Harry D. Easton, Jr., petroleum engineer, has been elected vice president of Great National Oil Corp. of Louisiana after 5 years' service in the Army from which he was released a colonel.

J. Earl French, formerly west coast manager for Freedom Oil Co., has joined Maritime Petroleum Corp. and Samuel F. Pratt Associates, Inc., New York. French will be West Coast manager for his new employers with headquarters in Los Angeles.

Charles Yu (actually Kya Lai Lu), acting financial director of the Natural Resources Commission of China's Petroleum Administration, has returned to his country after spending 9 months studying American accounting methods at Standard Oil Co. of New Jersey refineries.

Bouwe Dykstra has been appointed area manager at Midland, Tex., for Shell Oil Co., Inc. With Shell since 1926, he has served in Romania, Sumatra, and Colombia, and also as chief exploitation engineer in the Tulsa office.

William B. Golush, senior technologist of Shell Oil Co., Inc., has been promoted to assistant chemical department manager at the Wilmington, Calif., refinery. He succeeds **Bruce W. Dunbar,** who is being transferred to San Francisco. Other promotions in Shell's California division are: **Clifford M. Jarman,** computer to junior seismologist; **Charles R. Woodruff,** junior seismologist to party manager; **Russel V. McMurphy,** assistant chief dispatcher to chief dispatcher; **Edward T. Smith,** driller to drilling foreman; **James M. Denning,** analytical technician to senior technician; **Floyd R. Fairley,** engineering technician to senior technician; and **Merle L. Gould,** junior chemist to junior engineer. Transfers include: **Harry V. Church,** geologist, Bakersfield, Calif., to Casper, Wyo.; **Harry D. Curry,** geologist, Los Angeles to Bakersfield; **Stanley R. Jeffries,** junior geologist, Sacremento, Calif., to Bakersfield; **Loy M. Charter,** exploitation engineer, Coastal Division to Los Angeles Basin; and **Allen J. Morrison,** senior mechanical engineer, San Joaquin division to Los Angeles.

John Berdette Sandlin left Tulsa last week for Venezuela to accept a position with Consolidada de Petroleo of Venezuela.

J. A. Neath, director, Humble Oil & Refining Co., has been named to represent the South Texas Chamber of Commerce on the industry subcommittee augmenting the governor's advisory committee on veterans' affairs for Texas.

S. H. Fagadau, petroleum engineer, has been elected president of the newly organized North Central Texas chapter of the Texas Society of Professional Engineers. Other officers elected include: **A. J. Gates,** vice president, and **Walter Krog,** secretary-treasure.

David R. Edwards, employe relations director for Ohio Fuel Gas Co., has been advanced to a similar position for the Columbia Gas & Electric Corp. system with offices at Columbus, Ohio. **Howard Leckrone,** assistant personnel manager, has been appointed to succeed Edwards.

William P. Stone, industrial engineer of Lone Star Gas Co., has been named head of the industrial engineering department, Dallas division, succeeding **L. G. Waskom,** who is in ill health. **Frank Pope** of the Dallas division of distribution has been appointed district manager in Vernon, Tex. He succeeds **L. D. Black.**

L. C. Burroughs, assistant superintendent of the Houston refinery of Shell Oil Co., Inc., has been transferred to New York as assistant to the vice president, manufacturing department. Other Shell changes in the Gulf Coast area include: **Roy W. Faulk,** from assistant superintendent of the Norco, La., refinery to assistant superintendent of the Houston refinery; **J. B. Dunlap,** from manager of the cracking department at Houston to assistant superintendent of the Norco refinery; **K. J. Kitzmiller,** from manager of the treating department of the Houston refinery to manager of the cracking department; **T. T. McClellan,** from head of the effluent control department in New York to manager of the treating department of the Houston refinery.

W. T. Knight, Jr., secretary-treasurer of Consolidated Oil Co., has been promoted to general manager.

George H. Lancaster has been appointed automotive engineer in the technical department of Magnolia Petroleum Co. He was recently released from the Navy where he was engaged in research and development activities of the Bureau of Ordnance on aircraft rockets.

A. M. Orr, assistant district superintendent for Humble Oil & Refining Co.'s Stratton district, has been promoted to the post of district superintendent of the company's Scott & Hopper district. Orr, who entered service of the Humble company in 1919, was promoted to the assistant superintendent's post in May 1945.

Paul G. Benedum, Houston, Tex., has been elected president of Hiawatha Oil & Gas Co. and Penn-Ohio Gas Co., succeeding **A. F. Holliday,** pioneer oil man, who retires from active service after 55 years in the oil and gas industry. The Hiawatha and Penn-Ohio companies are controlled by Paul Benedum's uncle, M. L. Benedum, widely known wildcatter.

John H. Schaefer, Percy L. Griffiths, Harry W. Kaley, and **Stanley T. Crossland,** all vice presidents of Ethyl Corp., and **Albert Bradley,** executive vice president, General Motors Corp., have been elected to Ethyl's board of directors. Bradley takes the seat of **Donaldson Brown** who recently resigned as a director. The others constitute an increase in board membership from 10 to 14.

William J. Fischer, New Orleans, has been named chairman of the Louisiana Liquefied Petroleum Gas Association, succeeding **L. C. Parker** of Baton Rouge.

Matt Collins has arrived in Petrolia, Ont., on leave of absence from Trinidad, B.W.I., where he has been engaged in drilling operations.

Roland F. Beers, president of Geotechnical Corp., and **William B. Heroy,** former director of foreign production for the Petroleum Administration for War, have opened the firm of Beers & Heroy in Dallas to engage in consulting geology, geophysics and engineering.

W. D. Smith, Los Angeles, has been elected secretary-treasurer of Wilshire Oil Co., succeeding Guy Linton who died recently. Smith has been connected with Wilshire Oil Co. since its organization and has been assigned to administrative duties in recent years until his election as an officer of the company last week.

Martin G. Miller, petroleum engineer, and **M. R. Lents,** former chemist for Shell Oil Co., Inc., have joined J. S. Abercrombie Co. and Old Ocean Oil Co. as assistants to **J. R. Butler,** vice president and general manager. Miller will supervise subsurface and reservoir engineering while Lents will be in charge of plant operations. **J. R. Roetzel** has been appointed treasurer of the companies and will be in charge of the Houston office.

The August meeting of the Houston Nomads attracted a number of visitors representing oil activities in countries outside the United States. Among them was the group shown here: Back row—R. N. Posgate, G. W. van Hillo, and C. B. Dykster, all of Shell Oil Co., Inc.; I. B. Rollins, Standard-Vacuum Oil Co.; R. M. Fernandez, Petroleos Mexicanos; and Rafael R. Davile, Venezuelan consul representative. Front row—Jean Nougaro and E. D. Lynton, Institut du Petrole, Paris, France; D. E. Morgan, Socony-Vacuum of Colombia; and Neal Pickett, American Red Cross field director. Pickett, former Houston mayor who recently returned from 30 months in Europe, said an interest in international affairs will "be required of more and more citizens if America is to assume the economic and spiritual leadership which World War 2 seems to have handed us." Lynton described the program of exploration for oil and gas now being carried on in France. Fernandez told the group that greatly enlarged exploration activities are in store in Mexico in the near future

SHIFTS—

Joe J. McCullough, geologist, Union Oil Co. of California, Long Beach, Calif., to Boise, Idaho; **Warren H. Kraft,** engineer, Honolulu Oil Corp., Taft, Calif., to San Francisco; **E. R. Woolfolk,** geologist, Stanolind Oil & Gas Co., Farmington, N. M., to Durango, Colo.; **B. F. Patterson, Jr.,** engineer, The Texas Co., Sundown, Tex., to Gladewater, Tex.; **G. M. Potter,** president, Cascade Refining Co., Dallas, to Longview, Tex.; **John A. Neuman,** engineer, Atlantic Refining Co., Dallas, to Eagle Lake, Tex.; **R. C. Cranberry,** engineer, Humble Oil & Refining Co., Houston, to Corpus Christi, Tex.; **J. C. Stansbury,** engineer, Phillips Petroleum Co., Odessa, Tex., to Hobbs, N. M.; **Wm. S. Moses,** engineer, The California Co., Ferriday, La., to Natchez, Miss.; **David Crow,** Crow Drilling Co., Laurel, Miss., to Shreveport, La.; **R. W. Blackburn,** engineer, Continental Oil Co., Walden, Colo., to Villa Platte, La.; **Lloyd N. Johnson,** engineer, Magnolia Petroleum Co., Lawrence, Kans., to Crane, Tex.; **James W. Gilison,** engineer, The California Co., Ardmore, Okla., to Denver, Colo.

Edson H. Backey, assistant manager of Ohio Oil Co.'s general offices at Findlay, Ohio, has been promoted to manager.

R. S. Dean, assistant director of the U. S. Bureau of Mines, has resigned, effective September 1, after 20 years' service.

Alvin R. Summers, superintendent of Sunray Oil Corp.'s Gulf Coast division, has been transferred to Oklahoma City to head the newly created northern and western Oklahoma division following consolidation of Transwestern Oil Co.'s producing operations with Sunray August 2. Other changes as a result of the merger include: **Carl Wilson,** former superintendent of Transwestern's Texas division, who will be in charge of Sunray's offices in Alice, Tex.; **Eugene P. Heath,** superintendent of Sunray's Oklahoma City District, transferred to Kansas as superintendent of the Trapp-Sellens District; **William J. Hall,** former Transwestern superintendent, now in charge of Sunray's Bushton District; and **J. A. Parry, Charles P. Baker,** and **Howard Fish,** all former superintendents for Transwestern, who will now head the Hebbronville, Nordheim, and Premont districts of Sunray's Gulf Coast Division respectively. **R. H. Alagood,** manager of Sunray's district exploration office in San Antonio has been transferred to Jackson, Miss., and **M. J. Moore,** former Transwestern geologist, is now located in San Antonio. **F. E. Mettner** and **Fred Lillibridge,** Transwestern geologists, have been transferred from Kansas to Sunray's Tulsa and Midland, Tex., offices respectively.

POWER

for a

NATION on WHEELS

Oil is an indispensable source of power today in an America that moves on wheels to a greater future.

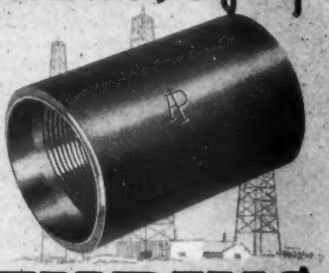
More than 15 years ago the First in Dallas pioneered in helping to provide for the financial needs of the petroleum industry. Today, the First in Dallas is geared to serve the oil industry and welcomes the opportunity to be of service to oil men everywhere.

1st NATIONAL

First National Bank in Dallas Member Federal Deposit Insurance Corporation

Coupled with Safety

WHEN YOU USE X QUALITY



OIL WELL TUBING COUPLINGS

You can always be sure of tight, trouble-free joints when you specify "X-L" Quality Couplings. Available in Plain or External Upset for standard tubing. Made from steel. Tested by Comparator to assure strict adherence to A.P.I. standards.

When ordering, please use our catalog description; it will save time and error.

WHEELING MACHINE PRODUCTS COMPANY

WHEELING, WEST VIRGINIA

JUST OFF THE PRESS! —

THE 1946 DIRECTORY OF REFINERIES AND NATURAL GASOLINE PLANTS

If you want a really accurate and complete list of key men in the nation's refineries and natural gasoline plants, this up-to-the-minute directory will fill the bill. Durably bound, and with page size of 8½ x 11, it offers you in a single low-cost volume:

An alphabetically arranged list of refineries in the United States and Canada, giving the names and titles of their key operating, purchasing and technical personnel.

A similarly arranged list of Natural Gasoline Plants and Cycling Plants throughout the country, with the main office, plant location and key personnel shown in each case.

A geographically arranged list of all the refineries, operating in the United States, Canada and Mexico, showing their crude oil and cracked gasoline capacity, and the type of products manufactured . . . plus a list of refineries that are now shut down.

A similarly arranged list of Natural Gasoline Plants and Cycling Plants showing input and output capacities.

PRICES

Single copies	$7.50 each
2 to 4 copies	$7.00 each
5 to 9 copies	$6.00 each
10 or more copies	$5.00 each

Published and Distributed only by

THE OIL AND GAS JOURNAL

Tulsa 1, Oklahoma

Equipment Men in the News

Bethlehem Supply Opens Sales Office in Denver

J. H. Ihrig has been appointed resident manager of Bethlehem Supply Co.'s new sales office in Denver. Ihrig's employment

J. H. IHRIG

E. S. LEWIS

dates back to 1922 when he became affiliated with International Supply Co. and continued with Bethlehem when it acquired International. When Bethlehem entered the Illinois field in 1939 Ihrig was placed in charge as district manager and continued in that capacity until his present promotion.

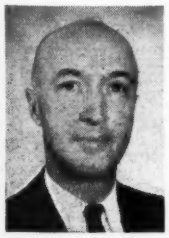
E. S. Lewis has been named district manager of Illinois district succeeding Ihrig. Lewis joined the Bethlehem organization in 1943 as a field representative. He was later promoted to store manager and then assistant district manager. His headquarters will be at Salem and he will maintain his residence at Mount Vernon.

Thomas Motor Freight Purchases L. & L. Company

Thomas Motor Freight, Dallas, has recently purchased L. & L. Trucking Co. of Tulsa, thereby gaining authority to operate in the 11 states of Arkansas, Illinois, Indiana, Kansas, Kentucky, Louisiana, Missouri, New Mexico, Oklahoma, Tennessee, and Texas. It will specialize in oil-field hauling and pipe stringing.

William B. Thomas, president, has been in the intrastate trucking business in Texas for 6 years. W. T. Flynt is traffic director of the new organization, having formerly been connected with B. F. Walker, Inc., of Houston. Offices will be maintained in both Dallas and Tulsa. C. R. Busch is manager of the Tulsa division.

Scamman Joins Homco



C. W. SCAMMAN

Charles W. Scamman joined Houston Oil Field Material Co. on August 1, and will be connected with its industrial sales department, specializing in heavy chemicals. For many years he was associated with Stanley Gill, consulting engineer. For the past 4 years he has been associated with J. S. Abercrombie and Harrison Oil Co. as engineer.

Fairbanks, Morse & Co. Adds to Railroad Division Personnel

E. A. Foster has been appointed manager of the application engineering department of the railroad division of Fairbanks, Morse & Co. with headquarters in Chicago. He will have direct responsibilities for all locomotive application studies. Foster was formerly with the electro-motive division of General Motors Corp.

J. F. Weiffenbach has been appointed chief engineer of the railroad division, also with headquarters in Chicago. He joined the Fairbanks-Morse organization from the electro-motive division of General Motors at LaGrange, Ill.

Frank Ross, Jr., who has been assistant in the railroad division for the past year, has been appointed sales engineer in charge of locomotive sales in the St. Louis area.

Frank M. Bosart has been appointed eastern manager of locomotive sales and will be located in the company's New York branch. Bosart also comes from the electro-motive division of General Motors.

Robert Aldag, Jr., has been appointed sales engineer in the Chicago district with headquarters in the Chicago office.

New Ryerson Plant in Los Angeles

Announced as the largest individual project in its expansion and plant modernization program, Joseph T. Ryerson & Son, Inc., through Everett D. Graff, president, revealed this week details of the construction that is well under way on their new steel-service plant on the West Coast.

Ground for the plant consists of a plot 8.7 acres. The warehouse building, made up of seven spans of which two are 600 ft. long and the largest 110 ft. wide, covers an area of 200,000 sq. ft. It is a steel frame structure with special type sheet metal siding and corrugated glass skylights.

The office building, which will also house rest rooms and recreational facilities, is a two-story brick and concrete structure with a floor area of 12,000 sq. ft.

New Oil-Industry Specialty Company Is Formed

Robert (Bob) Horton, formerly associated with the Link-Belt oil-country sales division for the past 11 years, with headquarters in Houston, has announced formation of Horton Equipment Co. He resigned from Link-Belt Co. August 1.

The new company will handle sales of specialties for the oil industry. Offices will be located at 1701 Marshall, Houston, with warehouse facilities at 1502 Maury.

New Sucker-Rod Wrench Company

Meeks Sucker Rod Wrench Co., 644 North Parkwood, Wichita, has taken over the distribution of the Meeks wrench from The S. M. Jones Co., of Toledo.

Introduced early in 1929 by W. C. Meeks, Sr., these were the first "snap" sucker-rod wrenches on the market. They are made for all sizes of sucker rods and couplings from ⅝ to 1 in. The business is owned by W. C. Meeks, Jr.

Courtney Becomes Emsco's Houston Plant Manager

PAUL COURTNEY

Paul Courtney, formerly sales manager for Emsco Derrick & Equipment Co.'s Houston plant, has been promoted to Houston plant manager.

Courtney spent several years in South America for Caribbean Petroleum Co. and upon return to the United States he entered the employ of Sinclair Prairie organization, later entered and operated in the oil business for himself for a period of 3 years, then joined Emsco in 1938.

Courtney succeeded C. L. Lamkin, vice president, who has managed the Houston plant since 1941. Lamkin has returned to Los Angeles to handle work in connection with all phases of the company operations.

Pipe-Line Company Is Incorporated

Holland Construction Co., Inc., Tulsa, pipe-line contractors, was incorporated under the laws of Oklahoma, July 1. President of the new corporation is H. T. "Bus" Holland, Jr., who founded the company 7 years ago. Holland previously spent 5 years with J. F. Pritchard & Co. and also had long experience with Ford, Bacon & Davis, construction organization.

G. G. "Tuffy" Griffis, vice president of the Tulsa firm, has had more than 25 years' experience in pipe-line construction work in the United States, Alaska and South America. He was formerly with the Swinerton & Walberg and the S. D. Bechtel construction companies. Secretary and treasurer of the company is V. M. Holland.

Radiography Laboratory Service

The new application of radiography to the oil industry is being stressed by the Industrial Radiography Laboratory, of Beaumont. Complete corrosion inspection of christmas trees and flow lines can be accomplished without shutdowns. Furnace tubes and other lines in the refinery can be inspected without the removal of the asbestos and the usual drilling and calipering procedure.

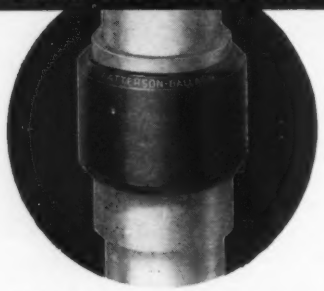
J. H. Stewart, formerly with Beaumont Iron Works Co. as chief chemist and assistant metallurgist, is serving as president of the company.

Reliance Expanding Field Sales Force

The Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, is establishing additional sales offices and expanding its present field sales force, it is announced by E. E. Helm, sales vice president.

George E. Law, who has represented the company in Minneapolis, will head a new branch office in Appleton, Wis. M. J. Sandling, who has served in western Michigan for the past several years, will head a new office to be opened in Grand Rapids. He will be assisted by W. F. Cliff, electrical application engineer. William K. Schlotterbeck rejoins the Philadelphia office as sales engineer. E. H. Koontz, sales en-

"Best Bet Yet"
SAVE YOUR TUBING!



Tubing collars worn by contact with casing steal the profit out of pumping. Patterson - Ballagh Plastic Tubing Protectors prevent both collar and casing wear. Oil-proof, wear-resistant, insulating. They are cemented to the collar under pressure and will not come off. Made in all sizes. End your tubing troubles. CALL in your Patterson-Ballagh man.

Specify "Best Bet Yet"
PATTERSON-BALLAGH
A DIVISION OF BYRON JACKSON CO.
PLASTIC
TUBING PROTECTORS

1900 E. 65th Street
LOS ANGELES 1
210 Post Street
SAN FRANCISCO 8
6247 Navigation Blvd.
HOUSTON 11
92 Liberty St.
NEW YORK 6

Are you getting these
HIDDEN PROFITS
in the chain you use?

Savings reflected from use of TAYLOR MADE Alloy chain are hidden profits. With twice the strength of ordinary chain you have fewer production delays. TAYLOR MADE'S longer life means less frequent replacement. Its terrific resistance to shock . . . grain growth and work hardness eliminates periodic heat-treatments—reduces operating and maintenance costs. Investigate TAYLOR today. Call your Mill supply distributor or write the factory direct.

S. G. TAYLOR CHAIN CO., Dept. I-9, Box 509-0-8 Hammond, Ind.

TAYLOR MADE Chain

gineer, is now with the company's New York office.

Other sales engineers recently assigned to field sales offices are: R. L. Custis to New York; D. M. Larson to Minneapolis; A. C. Perrin to Chicago; and Albert Mann to Detroit.

Meyer Made American Representative of Oil Well Engineering Co.

A. R. MEYER

A. Robert Meyer has been appointed American representative of the Oil Well Engineering Co., Ltd., and manager of its New York office in succession to E. T. Landgraff, who resigned to join Chiksan Co. Meyer has spent the last 3½ years in the U. S. Army Air Force and previously was in the employ of National Supply Co. at Toledo, Dallas, and elsewhere for a period of about 14 years.

Continental Supply Announces Personnel Changes

Continental Supply Co. has announced appointment of A. M. Rouse as manager of the Pratt, Kans., store, replacing D. L. Smith, who has been transferred to the Ellinwood, Kans., store as manager. Smith succeeds G. H. Slack at the latter point. Both stores operate under the supervision of F. B. Collett, Continental's assistant district manager at Wichita.

G. H. Slack, former Ellinwood store manager, has been named manager of the Denver office which operates under the supervision of J. R. Chapman, district manager at Casper, Wyo.

Dorroh Joins Hinderliter

J. O. Dorroh, for the past 20 years with Wilson Supply Co., has resigned and accepted a position with Hinderliter Tool Co., Tulsa, as manager of the Gulf Coast division with headquarters in Houston. Hinderliter Tool Co. is a subsidiary of The H. K. Porter Co., Inc., Pittsburgh.

Russell Goes to South America

T. W. (Terry) Russell, Jr., of McEvoy Co., manufacturers of well head equipment, gas lift and air-operated slips, left July 31 for a trip to Venezuela, Colombia, and back by way of Mexico.

Cardox Promotes Two

Appointments of Felix C. Rodgers as general manager of its fire division and of H. V. Williamson as director of research have been announced by Cardox Corp., Chicago.

For the last several years Rodgers has been a district manager for the fire division, with headquarters in Pittsburgh. As general manager he will make his headquarters at the home office in Chicago.

Williamson was formerly chief engineer of the company's research division.

Fricker Returns to Le Roi

D. E. Fricker has returned to Le Roi Co., Milwaukee, as assistant to the advertising manager, to handle sales-promotion work and trade shows. Prior to his entry into the Army, Fricker carried on the advertising work of the same organization.

Hawkins Heads Chicago Office Of Barnes Corporation

The John S. Barnes Corp., Rockford, Ill. has announced that its Chicago branch office is in charge of E. C. Hawkins. The office is located at 1112 Field Building, 135 South LaSalle Street.

Under the new arrangement, hydraulic sales in the Chicago area will be under the direct supervision of E. C. Hawkins. For several years Hawkins has been manager of the company's eastern sales office at Newark.

Contract Award Announced

Award of a contract from Cincinnati Gas & Electric Co. to handle the engineering and supervision of erection of what will be the fourth largest propane-air plant in the gas-utility industry is announced by E. A. Flaschar, general manager of Stacey-Dresser Engineering, a division of Stacey Brothers Gas Construction Co., one of the Dresser Industries.

Formerly vice president of Hydrocarbon Research, Inc., Flaschar was for 9 years executive engineer of M. W. Kellogg Co. and for 8 years assistant chief engineer in one of the Standard Oil Co. of California refineries.

Pressure Weld Moves to El Paso for New Project

Pressure Weld Co., Houston, announces the removal of its office from 421 Niels Esperson Building to the eighth floor, El Paso Natural Building, El Paso. The office is under the management of E. P. Jones.

The move to El Paso of the personnel and equipment of Pressure Weld Co. will facilitate operations on El Paso Natural Gas Co. pipe line from West Texas to California.

Pacific Pumps, Inc., Expands Its New York Staff

Pacific Pumps, Inc., Huntington Park, Calif., manufacturers of centrifugal pumps, announces the addition to its New York staff of R. C. McDonald.

McDonald's background includes the engineering and economic selection of pumps and compressors, refinery, and chemical-plant installation, with Worthington Pump & Machinery Corp. and Foster Wheeler.

Bovaird Moves Store

Bovaird Supply Co. has moved its store from Benton to Clay City, Ill., according to W. M. Bovaird, president of the company. Rudy Rudrauff, former manager of the Benton store, is in charge at Clay City.